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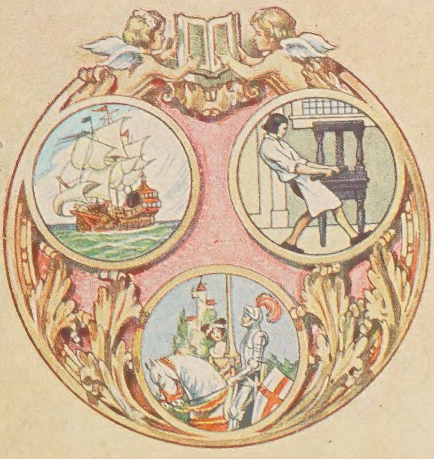
XI. THE WONDER OF LIFE

Vol. X

WISDOM

OUR WONDER WORLD

A Library of Knowledge



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VOLUME TEN

THE QUIZ BOOK

"The time has come," the Walrus said,
"To talk of many things:
Of shoes — and ships — and sealing wax —
Of cabbages — and kings —
And why the sea is boiling hot —
And whether pigs have wings."
Lewis Carroll

EDITOR'S INTRODUCTION

IN the old legends it was always a question which broke the magic spell and unlocked the closed doors. To-day the question has by no means lost its power. But the point still is, as in the olden days, "Who shall ask the question?" Shall it be the one who seeks knowledge using the question as a key which will unlock its storehouses, or shall it be, as in the case of Socrates and of the college professor giving a "quiz" to his students, the one who has the information asking to stir the minds of others to think out the answer? In daily life choice must be made between the two methods; in a book we can use both. The question may be asked and answered by the one who knows and desires to give the information, or it may be asked by the one who desires to know, which is the better way. So we have gathered here a multitude of questions which people have asked and of facts which everyone should know. For the first set we have written answers; and for the second set we have put questions. The result is this "Quiz Book" with its "Why?", "How?", "Who?", "What?", "When and Where?", and "If" pages, its glimpses "Behind the Scenes," its short stories, and its longer articles.

The aim of the volume has been to present life from the everyday point of view, to start with the stream of happenings which make up our life and follow them back to their sources. We talk. How many words do we use? Where did they come from, and how were they formed? We mail a letter and it reaches its destination. What has happened to it in the interval? We buy a newspaper. How was the news gathered, and the sheet planned and printed? We live under a system of government which is the outgrowth of centuries of experience and effort. How does it affect us, and how shall we adapt ourselves to it? The main facts are given for older readers, and for the younger Miss Mabel Hill has told what every boy and girl should know about town, city, state, and nation. Again, we must meet the calls of daily life. How can we best equip ourselves? How shall our boys and girls be trained? A group of the leading educators of the country have given their answers. The plan of the volume has been to work from the general to the particular, and from the world in its relation to us, to us in our relation to the world.

The editor wishes to acknowledge indebtedness to the group of bright people who have supplied stories, questions and answers, tricks, puzzles, and pictures in

abundant and unfailing measure, and especially to Mr. Edward I. Farrington, to whom we owe many of the outdoor articles as well as valuable assistance in other departments. As Alice proved in her visit to Wonderland, one cannot find out everything at once, but we have tried to take the place of the Walrus and the rest of that obliging and versatile group who sat down together to "talk of many things, of shoes — and ships — and sealing wax — of cabbages — and kings — and why the sea is boiling hot — and whether pigs have wings"!

CONTENTS

VOLUME X

FULL-PAGE ILLUSTRATIONS

In addition there are 143 illustrations in the text, of which those with titles are catalogued under their respective subjects in the General Index.

THE WASHINGTON MONUMENT, SEEN FROM THE WHITE HOUSE

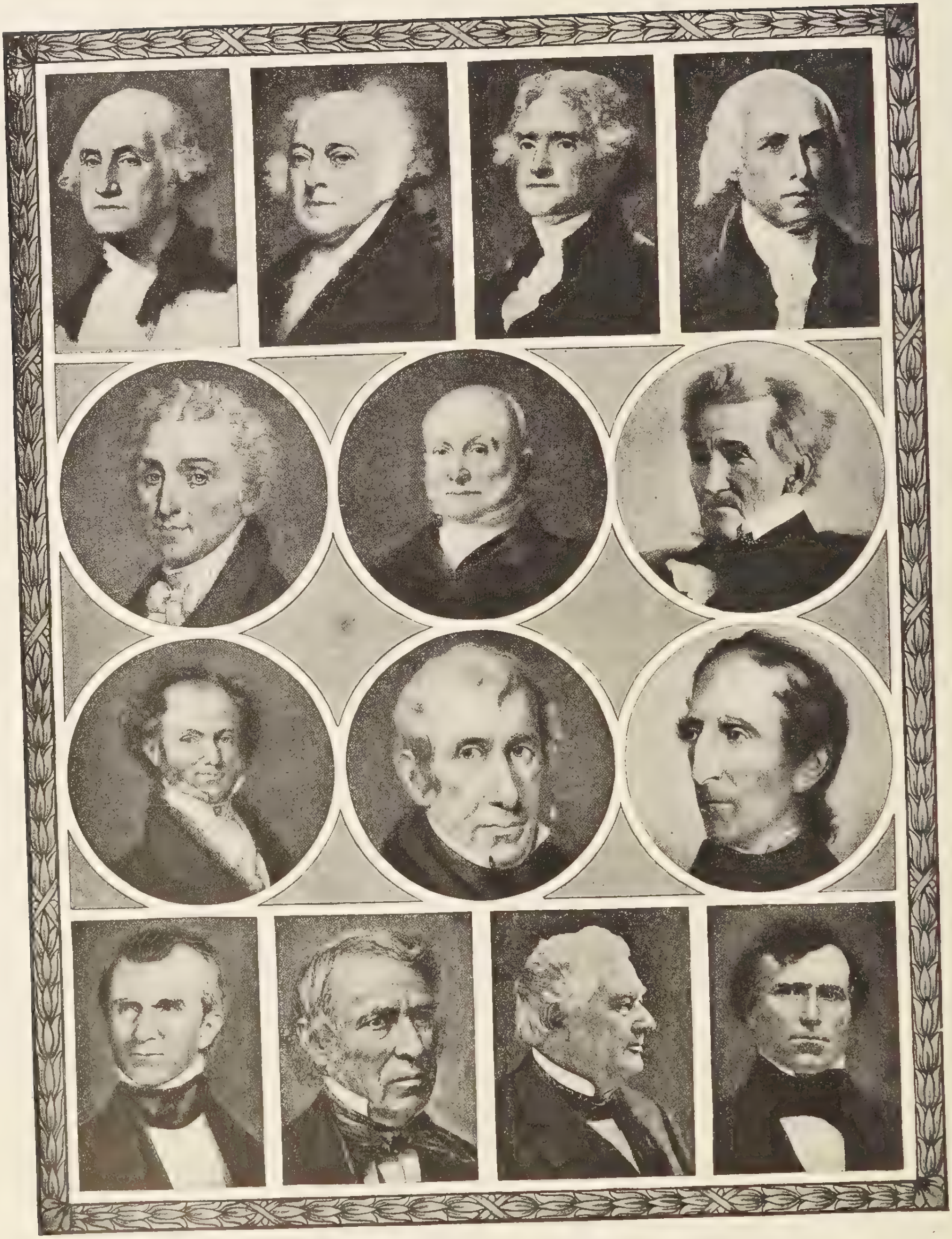
HOW ARE WE GOVERNED?

EVERY nation has some things of which it can be proud. The United States, among other things, may well be proud of its government. The Constitution, devised a century and a quarter ago, has sufficed for the needs of a nation that has grown more rapidly and more extensively than any other, whose population is not only vast but amazingly varied, a land in which new problems of government have constantly arisen, to be solved successfully by this same Constitution.

It is noteworthy that this republic is most definitely established for the benefit of the people as a whole, that each individual is constantly receiving attention and care, that there is no privileged class, such as is found in almost every other nation, and that under the management of this system of administration there are larger and more numerous opportunities for individual progress than seem possible anywhere else.

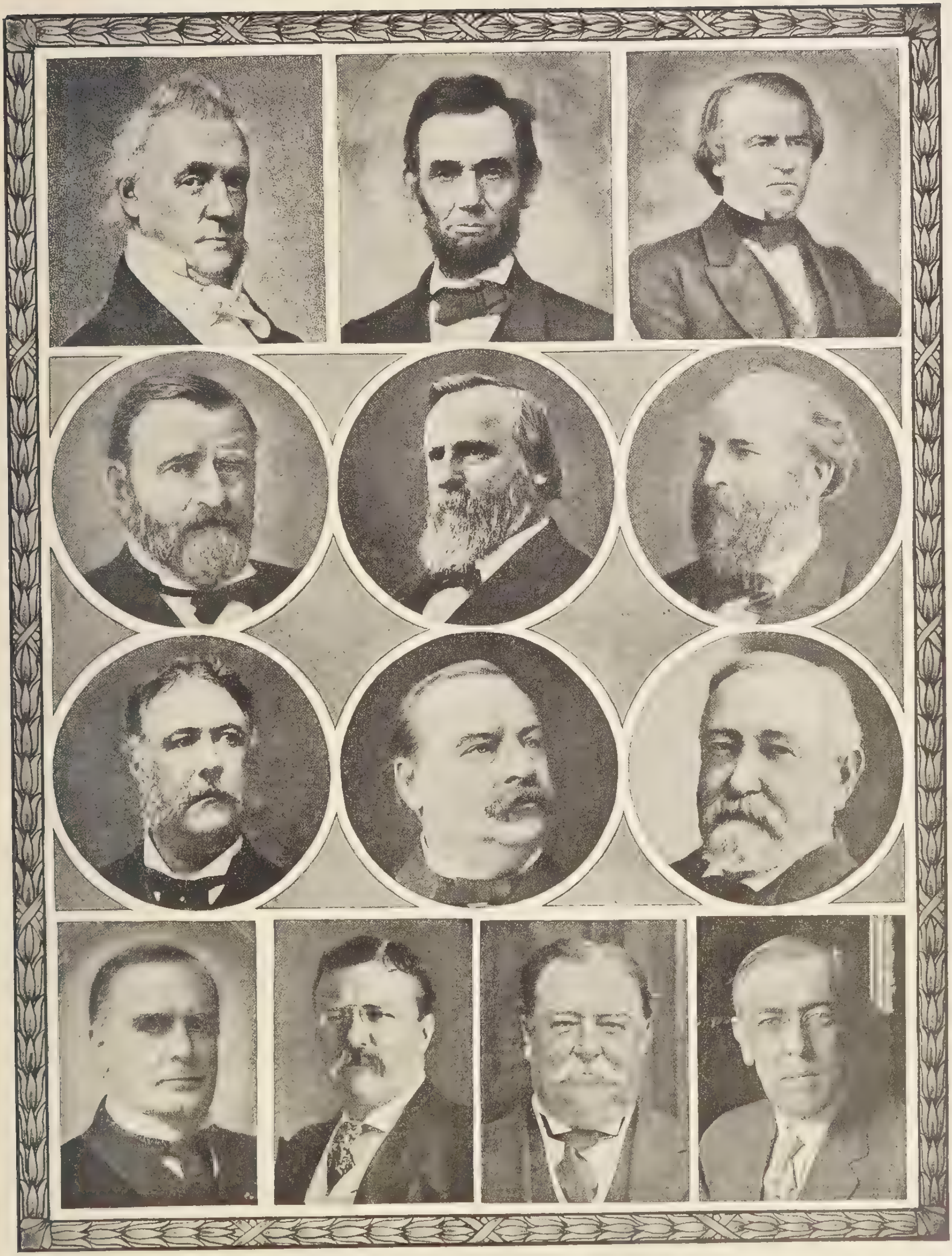
This statement is brought out by two recent illustrations. At the commencement of the great European War, when so many thousands of American travelers were left stranded penniless abroad, the United States promptly sent over two of its own vessels with millions of dollars to be spent in caring for its distressed citizens and bringing them back to their own country. These people in their need received immediately the help and protection of their government; they realized as probably never before how much they could rely upon its wisdom and power.

The other example is found in the distribution of public lands, reclaimed by irrigation in the West. Here the government has constructed system after system of irrigation plants at a colossal expense, prepared great regions of hitherto desert land for cultivation, and then placed it in the hands of any who cared to take it up in return for a series of small yearly payments toward defraying the original outlay. No one may take more than a limited amount of land nor hold more than he can himself cultivate and manage.



OUR PRESIDENTS — FROM WASHINGTON THROUGH PIERCE

Can you give their names? The dates of their terms of office are given here. If there are any whom you cannot name, turn to Volume VIII, page 393. 1789–1797; 1797–1801; 1801–1809; 1809–1817; 1817–1825; 1825–1829; 1829–1837; 1837–1841; 1841; 1841–1845; 1845–1849; 1849–1850; 1850–1853; 1853–1857.



OUR PRESIDENTS — FROM BUCHANAN TO WILSON

1857–1861; 1861–1865; 1865–1869; 1869–1877; 1877–1881; 1881; 1881–1885; 1885–1889; 1889–1893; 1893–1897; 1897–1901; 1901–1909; 1909–1913; 1913–1921. For full list with names and dates since 1921, see Volume VIII, page 303. (Photographs of Presidents Taft and Wilson, copyright by International News Service and Underwood & Underwood respectively.)

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PRESIDENTS HARDING AND COOLIDGE

In both these cases everybody has been treated with absolute equality; each individual has equal rights and equal opportunity.

As a matter of fact, every citizen of the United States is a stockholder or, if you like, a partner in the great business organization which we call the "government." For this reason it is well that all of us should have some idea, at least, of the various branches through which our interests are cared for and managed.

THE CONSTITUTION

The plan on which the nation is managed is, of course, the Constitution, which provides that matters concerning the whole country shall be handled at Washington, by what is called the "federal government," while matters concerning individual states or cities shall be dealt with by those communities themselves.

THE FEDERAL GOVERNMENT

The regulation of the relations between the United States and foreign countries and of all other affairs affecting the nation as a whole is managed by three groups of officials: the executive, the legislative, and the judicial. The executive consists of the President and his Cabinet, with many departments and bureaus; their duties are to carry on the administration of the government of the country. The legislative group is made up of the two houses of Congress, which make the laws. The judicial consists of the courts, which explain the application of the laws and judge the cases brought before them. Each of these groups serves as a check upon the assumption of overmuch power by the others.

THE PRESIDENT

The President must have been born in the United States and must be over thirty-five years of age. He is elected by the people, but through an indirect method. The voters in each state choose electors, who meet in a convention and cast their votes for the candidate for whom they pledged themselves to vote. Each state has a number of electors proportioned to its population, and the party that records the most votes sends all the electors from that state. The choice of electors is made on the Tuesday following the first Monday of November. This election decides the contest, although the electors do not cast their votes for the actual election of the President until some weeks later.

The term of office is four years; following the example set by George Washington, no President has ever held office for more than two terms. He can be removed from his high office only for treason, bribery, or other grave misconduct.

His duties are to execute the laws, manage the foreign relations of the country, command the army and navy, appoint many of the officers of the government, and suggest action to be taken by Congress or the courts. He also has the power to veto legislative measures passed by Congress, and to grant pardons and reprieves to prisoners.

The Vice-President is chosen in the same manner as the President. His duties are to preside over the Senate, with the right to vote only in the case of a tie. In case of the President's death or removal from office, he becomes President for the remainder of the term. Should he also die or be removed, the Secretary of State succeeds to the headship of the government.

THE CABINET

The duties of the President are so manifold and diverse that he intrusts the details to ten officials, known as "secretaries," each of whom is the head of a department. These secretaries compose the Cabinet; their departments are

as follows: State, Treasury, War, Justice, Post Office, Navy, Interior, Agriculture, Commerce, and Labor.

THE STATE DEPARTMENT

All matters associated with the nation's foreign affairs, such as treaties, embassies, consular arrangements, and passports, are cared for by this office. The Great Seal of the United States, the correspondence between the President and the chief executives of the individual states, and the publication of laws, constitutional amendments, and certain proclamations are also in the charge of this department. The Secretary of State is thus one of the most important members of the President's official family.

THE TREASURY DEPARTMENT

Besides manufacturing and issuing money, the Treasury makes estimates of the amounts needed for public service and of the means of raising these amounts. Therefore the customs and the internal revenue are both controlled here, and banks, of course, are under the general supervision of this office. The Secret Service really belongs to this department, as its principal task for many years was the detection of forgers and counterfeiters, although employees of the service are transferred to other branches of the government for special tasks. For reasons that are too complex to be stated here, the coast-guard and public-health branches of the public service are also administered by the Treasury.

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THE BRITISH EMBASSY, WASHINGTON, AND JAMES BRYCE, ONE OF THE MOST DISTINGUISHED AMBASSADORS SENT TO THIS COUNTRY BY GREAT BRITAIN

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A GROUP OF FOREIGN DIPLOMATS

Top (left): Minister from Turkey. Top (right): Minister from China. Bottom (left): Minister from Denmark. Bottom (right): Ambassador from Italy.

THE WAR DEPARTMENT

Apart from the maintenance of the army and estimates of all expenses for that purpose, the War Department has charge of all military education, including the Academy at West Point, of ordnance, fortifications, coast defense, river and harbor improvements, and even the approval of all bridges erected over navigable waters of the United States. Military posts and all lands connected with this service are under its jurisdiction. It must be remembered that the affairs of the navy, however, are provided for in the Navy Department.

THE DEPARTMENT OF JUSTICE

The head of this department is the Attorney General. Under him rank the Solicitor General, the District Attorneys, and the United States Marshals. These legal authorities represent the United States in all cases involving the government, and the Attorney General also acts as legal adviser to the government. Naturally the Department of Justice and the Supreme Court maintain close relations.

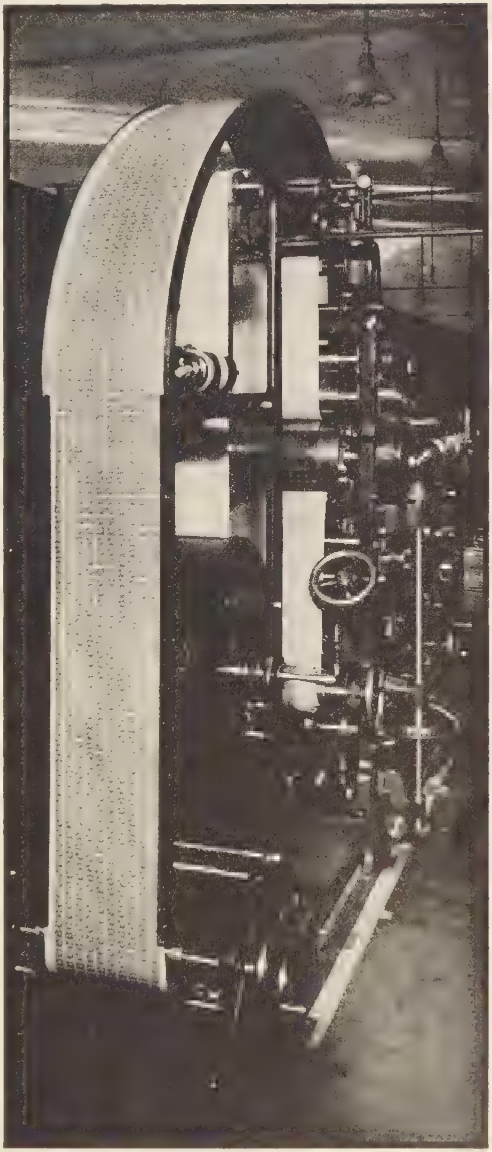
THE POST OFFICE DEPARTMENT

Obviously this is one of the largest branches of the national public service. Letters, parcels, and other communications have to be dispatched to every part of the world at the greatest possible speed and yet at the least expense. The sum of the trifling amounts paid for this service is almost sufficient to defray the cost, great as this is.

Curiously enough, the Post Office is of great use in checking and preventing unsound or illegal business on any considerable scale. The use of the mails is refused to any person or firm which tries to carry on enterprises of which the government does not approve.

The stamps for every division of the office are made by the Bureau of Engraving and Printing, a branch of the Treasury Department.

The Postmaster General, who is the head of the Post Office Department, makes postal treaties with foreign nations, subject to the approval of the President.



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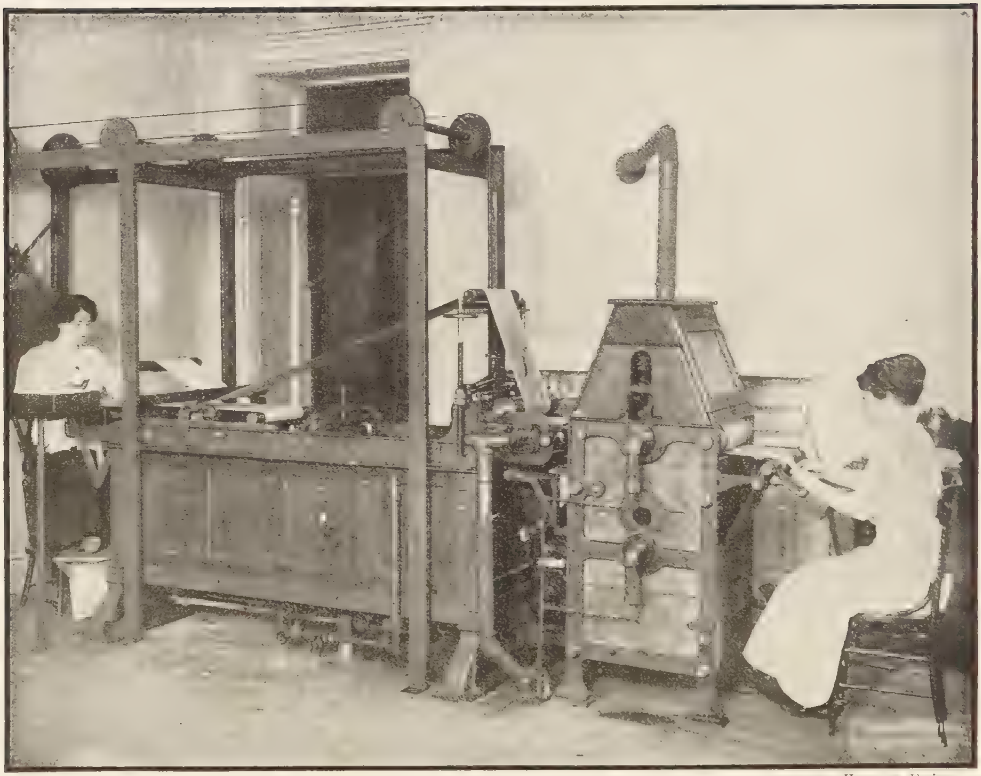
STAMP-PRINTING MACHINE

Ten of these machines will turn out daily the 3,500,000 stamps needed by the Post Office Department, performing the work of printing, gumming, perforating, and coiling the stamps.

THE NAVY DEPARTMENT

Although this department is very closely related to the War Department, the navy is so



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WASHING SOILED PAPER MONEY AT THE BUREAU OF ENGRAVING AND PRINTING

important that it requires separate consideration. The danger from invasion is so slight that a large army is not needed, but in case of war or trouble, even in other countries, the navy is useful for many purposes. Its services in time of war between the United States and some other nation are obvious, and in times of warfare abroad it is the means of preserving neutrality, protecting the interests of the United States throughout the world, and affording aid to American fugitives. Both army and navy are used extensively in association with other departments as a means of extending commercial activity, and also to supply information regarding the nature of regions of land and sea which are not well enough known.

The story of the navy, especially from the point of view of the man who becomes a part of it, is told on page 301 of this volume.

THE DEPARTMENT OF THE INTERIOR

This has become one of the most important of the departments. For many years the development of the country was left to individuals without the guidance of scientific learning and investigation.

For some time past, however, it has been more and more clearly seen that much of the wealth that might be produced from the various resources of the country was being neglected or else wasted. This department and the Department of Agriculture (see below) have accordingly begun the study of increasing the products of each region.

The Geological Survey has been engaged in surveying the United States and Alaska and issuing maps since 1882. About one third of the country's area, over one million square

miles, has been mapped, and thirty parties of surveyors are constantly in the field, exploring the country in districts and adding annually thirty-five thousand miles of completed topographic surveying. This is an area nearly the size of Indiana and greater than Maine.

The sheets and maps forming the great topographic maps represent areas called "quadrangles," whose boundaries are meridians of longitude and parallels of latitude. In New England and other populous areas these quadrangles cover two hundred and thirty square miles, the scale being one mile to the inch. The cultural features of the country, such as roads, railways, cities, towns, etc., as well as all the lettering, are in black; all water features are printed in blue, while the hill features are shown by brown contour lines. The maps show all the surface forms of the land, such as mountains, hills, valleys, and gulches; all bodies of water, such as lakes, marshes, streams, and springs; the routes of travel, artificial features, boundaries, hamlets, and even every house, except, of course, in thickly populated centers. Elevations are very carefully and accurately depicted by "contour lines," which show every increase of twenty feet in height above sea level. Each contour line passes through points which have the same altitude, so that a person who follows a contour will go neither uphill nor downhill, but on a level. These lines indicate the shapes of plains, hills, and mountains, as well as their height above sea level.

Not only does the Geological Survey do this, but it also has charge of all the problems that concern the mineral properties of the country. It works out a careful estimate of the mineral wealth of a region and also maintains a staff for the purpose of testing coal, building materials, and other mineral products. As it has been decided that water is a mineral, the questions regarding the water supply for irrigation, power, and purity are all submitted to this survey.

The department also oversees the distribution of the public lands in such a manner that every person desiring to take up land shall have fair treatment, while the speculator is shut out.

The Reclamation Service carries on the work commenced by the Geological Survey by taking steps to redeem land that needs irrigation or other improvement to make it useful.

The Bureau of Mines likewise continues work begun by the survey.

In other fields, such as education, patents, pensions, and the care of the Indians, the department contributes a great deal toward the welfare and improvement of the nation.

THE DEPARTMENT OF AGRICULTURE

In this field, which has grown to immense proportions during the last fifty years, the greater part of the work is of immediate and direct benefit to a large number of people, and indirectly affects the comfort and health of every inhabitant of the United States. The following, which comprise but a few of the principal interests and activities of the department, will show at once the importance and scope of its work. The Weather Bureau,

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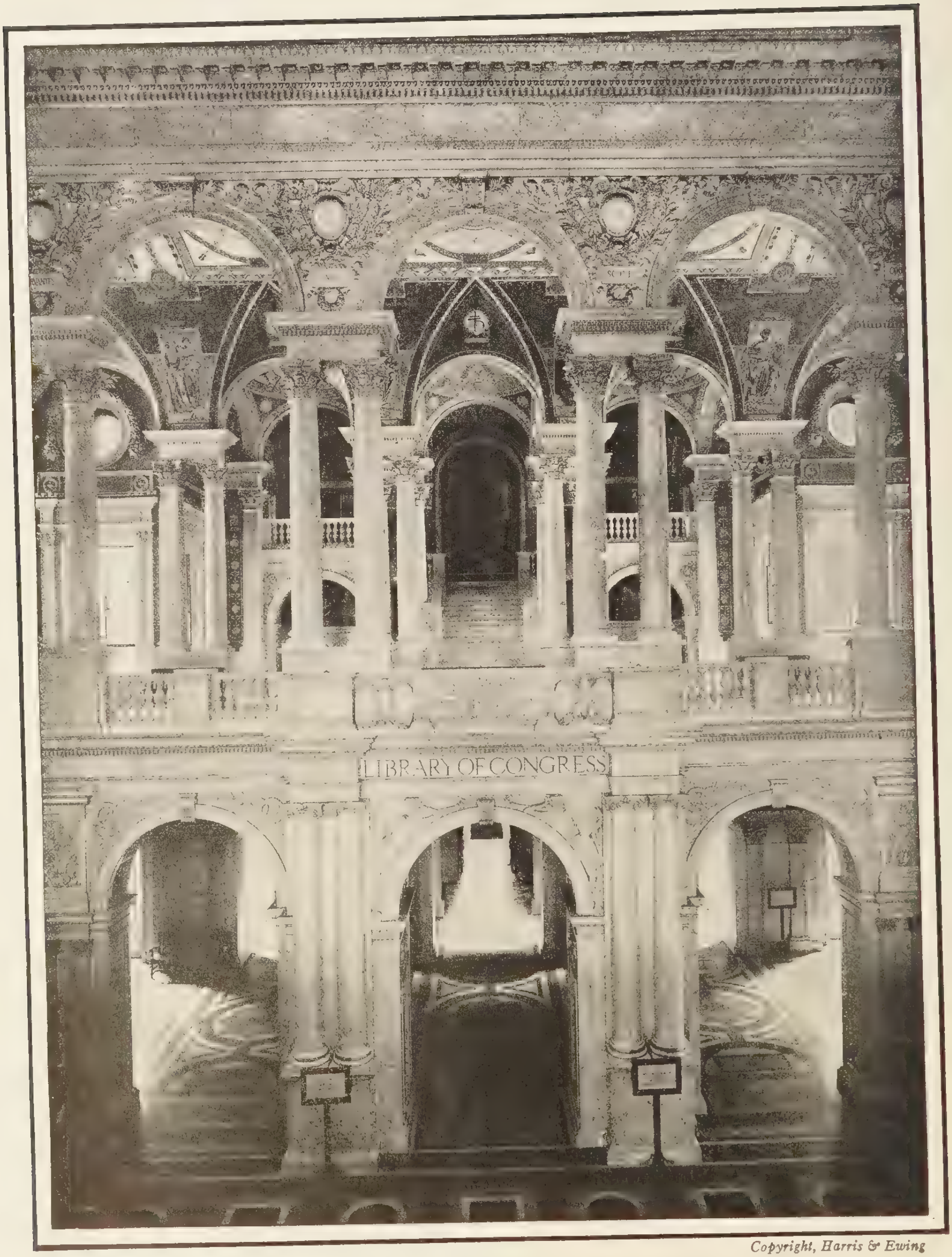
MILLICENT TONGO CHANG, DAUGHTER OF A CHINESE MINISTER TO THE UNITED STATES



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ENTRANCE CORRIDOR OF THE LIBRARY OF CONGRESS, WASHINGTON

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READING ROOM OF THE LIBRARY OF CONGRESS, WASHINGTON

the enforcement of the pure food laws, cattle quarantine and the general treatment and suppression of cattle disease, the forest conservation and the game laws, the agricultural experiment stations, all these are but a portion of the problems handled by the army of employees belonging to the department.

THE DEPARTMENT OF COMMERCE

The promotion of commerce has become of such importance to the nation that a whole department is devoted to that end. Manufacturing, mining, shipping, fisheries, and transportation, all receive attention. The lighthouses and lightships, the taking of the census, the coast surveys, and the equipment of vessels with wireless apparatus are some of the details that are included in the work.

THE LABOR DEPARTMENT

The increasing responsibilities of the government in connection with questions relating to labor have made it necessary that these matters, formerly handled by the Department of Commerce, should be dealt with separately to some extent. Not only the publication of information regarding labor interests in this and other countries, but the supervision of immigration, the compensation of artisans for injuries, and the fostering of manufactures come within the powers of the Labor Department.

ADDITIONAL EXECUTIVE BRANCHES

There are certain offices which are independent of these departments; such are the Library of Congress, the Smithsonian Institution, the Interstate Commerce Commission, the Civil Service Commission, and one or two others.

But all these departments and branches of the executive service, from the President down to the least of the office boys, are busied with only one object; namely, to carry on the business of the nation in accordance with the Constitution and the instructions of Congress. The brief summaries given above have indicated the general nature of the work that each department has on its hands. The amazing variety of tasks set for the government and its employees will be better realized by glancing through the following list of problems successfully handled by various branches of the service:

Supplying oysters with better food.

Developing a cotton tree.

Discovering profitable uses for inferior coal.

Constructing model towns.

Detecting the causes of cattle fever and stamping them out.

Discovering prehistoric monsters and placing them on exhibition.

Inducing the pearl shell to grow in larger quantities.

Catching rats.

Determining the amount of injury or good done by each of the birds and animals of importance throughout the country.

Saving the farmers' money by prophesying the weather accurately for days in advance.

Searching for insects, birds, or bacteria that will help the farmer.

Making the green persimmon edible.

Creating new fruits and improving the quality of the old ones.

Finding a market for American goods.

Making catalogues for libraries.

Exploring the remote parts of the world.

Studying the stars.

Measuring the amount of water in the sun to see how it affects the weather.

Making artillery.

Printing fourteen magazines and also hundreds of books a year.

Fighting army worms.

Testing foods.

Fighting and preventing forest fires.

Reporting the nature of foreign industries.

The government not only does all these things, but will inform the public about the methods employed and the progress made, except in a very few instances, where the work is kept secret for obvious purposes, as in the Secret Service or in some branches of the War and the Navy departments. In fact, the government maintains the largest publishing house in the world and spends more than six million dollars a year on printing alone. If you desire any of their publications, write the Superintendent of Public Documents and explain what you are interested in and he will do the rest.

Of course it takes a tremendous number of

TOP: INTERIOR OF THE UNITED STATES SENATE. BOTTOM: INTERIOR OF THE HOUSE OF REPRESENTATIVES

people to look after all the duties, for this list mentions merely some of the more peculiar matters that are taken up in the course of the regular work of a department. Much of this is routine, but requires time, care, and accuracy.

Roughly the work can be divided into three groups: bookkeeping, manufacturing, and investigating. The number of people employed, including the heads of the departments, is well over five hundred thousand, exclusive of the army and the navy. The list below shows how this host is organized.

DISTRIBUTION OF OFFICERS AND EMPLOYEES IN EXECUTIVE DEPARTMENTS OR BRANCHES

DEPARTMENT	
State	4,359
Treasury	51,532
War	42,292
Justice	3,671
Post Office	308,740
Navy	43,425
Interior	16,350
Agriculture	21,702
Commerce and Labor	20,951
Government Printing Office	4,080
Interstate Commerce Commission	1,917
Civil Service Commission	457
Smithsonian Institution	528
Veterans' Bureau	23,696
Other Branches	17,392

The salaries paid run into millions of dollars, from the President himself, who receives $75,000 and the use of the White House and its furniture, down to apprentices and the like, who get $225 a year. As in all business, the greater the responsibility, the greater the compensation. The majority of responsible positions average somewhere about four or five thousand dollars a year, and the average clerical position is worth somewhere near fifteen hundred or two thousand dollars.

THE COLONIAL GOVERNMENTS

The foreign possessions of the United States are administered by officials chosen at Washington, although the Philippines are being educated in the art of self-government.

THE LEGISLATIVE BODIES

The United States, like any large business firm, has to have a definite system of rules and regulations, which are called "laws." The persons who frame these laws are known as "legislators" and belong to the Senate or the House of Representatives.

The Senate consists of two members from each state, elected either directly or indirectly by the people for a term of six years. The House is made up of a much larger number of members, representing the nation on a basis of population; that is, the members of the House are elected directly by the people, and there is one member for about every two hundred thousand persons. The division of the country into districts of equal proportions is arranged by the state legislatures.

The duties of the Senate are to handle bills submitted to it by the House, to approve or disapprove the President's appointments of federal officers and the treaties drawn up by the President, and lastly to try the cases of impeachment brought in by the House.

The duties of the House are to consider bills introduced in it and pass them on, if it approves of them, to the Senate. It also makes the charges against officials who are to be impeached and tried before the Senate.

The greater part of the work of both houses is done in committee. This means that all matters for consideration, such as proposed laws, are first of all handed over to a committee whose business it is to deal with all matters related to the particular topic of this proposal. After it is discussed and put into the form that seems best to this committee, it is brought before the House as a bill.

If it passes both houses and is signed by the President, it becomes law; if it is not signed by the President, it becomes law in ten days' time: but if he returns it to Congress with his veto, it cannot be made a law unless it again passes both houses by a two-thirds vote.

All members of Congress receive a liberal allowance for stationery and for traveling expenses to and from Washington; in addition to this they receive $10,000 a year as salary.

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THE SUPREME COURT AND THE ROOM IN WHICH IT MEETS

THE JUDICIARY

It is one thing to make laws; it is another to determine the nature and extent of their application. A law, for example, relating to sugar may use just the word "sugar" and no more; but there are many kinds of sugars, whether considered from the point of view of the manufacturer or the scientist. Thus it comes about that the interpretation to be placed on the law may vary. Furthermore, people may read a different meaning into the words. Or again, disputes are bound to arise which have to be settled in accordance with the law. Every government must have courts and judges to settle such matters. Cases and questions that concern only city or state are determined by the courts of city or state, but all matters that relate to the federal government must be handled by the federal courts. Therefore these courts try such cases as arise from disobedience of the main government, from disputes between that government and individuals, and from disputes between persons from different states or between the states themselves. They have also the task of explaining the application of all laws made by Congress.

There is one Supreme Court before which cases affecting ambassadors or in which a state is a party are brought direct; the nine Circuit Courts and some ninety District Courts handle all other cases, except that appeals from these courts can be taken to the Circuit Court of Appeals, and then in some cases to the Supreme Court. The Court of Claims is a special court organized for the purpose of considering claims against the United States. In certain cases, where a question of federal law arises, an appeal can be made from the state courts to the federal courts; otherwise the state and city courts are independent and appeals cannot be brought from them to the federal authorities.

The judges' salaries range from $20,000 to $10,000.

In connection with the federal judiciary there are attorneys, marshals, and other officials retained by the government to represent it and assist in the work of the courts.

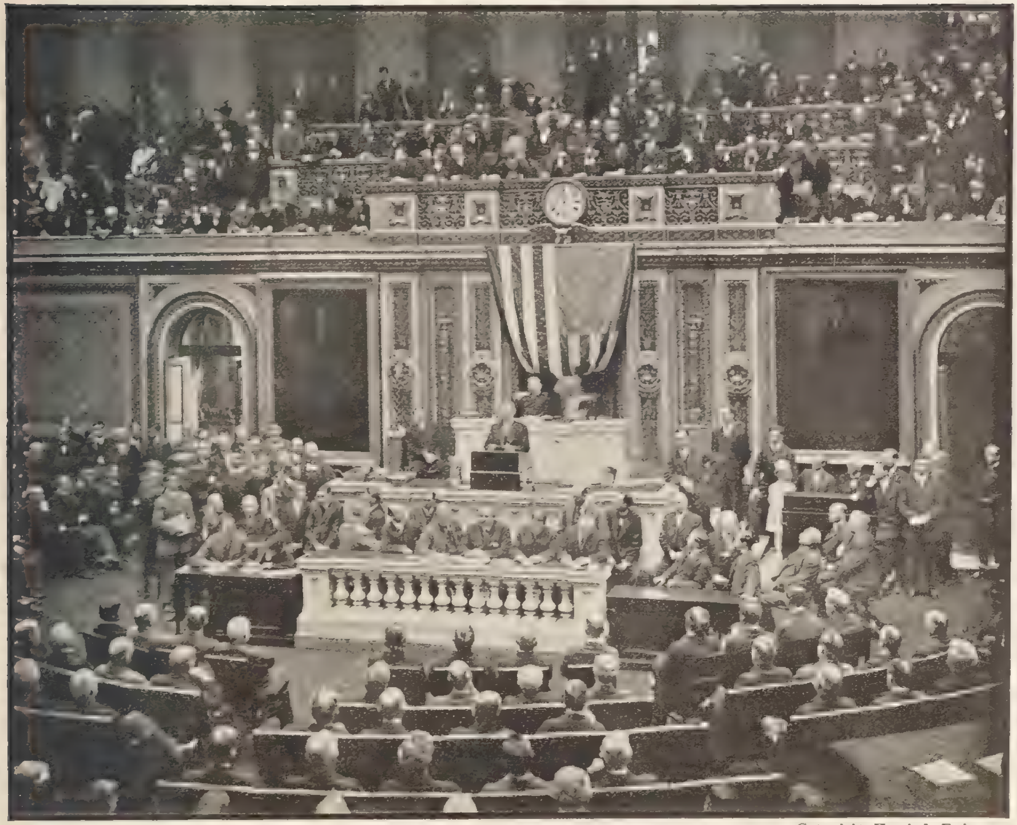
A VISIT TO THE SUPREME COURT

Promptly upon the stroke of twelve o'clock, noon, there is a rustle of silken robes and the door of the robing room of the justices of the Supreme Court of the United States opens as if by magic. Headed by the Chief Justice, the procession of nine judges walks with stately tread across the marble floor of the corridor and enters the courtroom. The silken rustle carries the observer back to other days — the days of powdered wigs and knee breeches. It is the last remaining emblem of the dignity of the law as carried out in style of dress. The long black robes are of an exquisitely fine and heavy quality of silk and have the appearance of the gowns worn by Oxford University graduates, their dull blackness being relieved by a touch of velvet upon the shoulders and at the front.

The lawyers who occupy the stall in front of the long bench or desk and the spectators present rise and remain standing until the justices are seated. Then the court is declared open.

It is the highest tribunal in the land, and the most dignified. With great volumes of law reference books and records of cases before them, the justices sit, apparently giving but little heed to the arguments of the counsel who presents the case, but with alert minds and quick discernment absorbing the subject presented. This high court is frequently conspicuous by the absence of the most vitally interested parties, or by their silence, if they should for any reason be present. The cases come from the lower courts and are technically uninteresting to the ordinary visitor, but the decisions handed down may be of national and even international importance.

The room in which the sessions are held is most interesting historically, for until 1859 it was occupied as the Senate chamber; and its walls might well echo with the voices of orators now long gone but whose eloquence still stirs our blood, as we call to mind the names of great men like Clay and Webster who have argued there for freedom and the cause of justice.



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THE PRESIDENT ADDRESSING CONGRESS

AN HOUR IN THE CONGRESS OF THE UNITED STATES

THE visitor who is shown to a seat by the courteous doorkeeper of the Visitors' Gallery in the House of Representatives has a feeling of disappointment when he looks down upon the lawmakers and observes the routine of the afternoon's business. There in the semicircle that has a seating capacity of nearly four hundred are perhaps twenty-five, or maybe not so many, men who form the audience of the orator who stands over near the center aisle. No, they are not in reality this statesman's audience, for that means that they would be listening with more or less attention to what he is saying. They are not. Some are writing, some reading. Back on the leather-covered lounges at the rear of the hall, but in full view of the people in the galleries, are two or three men talking and laughing, and over near the west side there is nobody at all. Where are all these men who were elected to represent their congressional districts in Washington and why are they not in their seats listening to the proceedings of the House? There in his chair back of the great white marble desk is the Speaker, but like some of the other members he appears to be as little interested in the thing the man talks about as if he were in another room. Who is that keen-looking man with the gray hair and strong chin who just entered and took a seat near where the orator stands? He seems

to be the only one who is listening — and he may well follow every word attentively. He is the official reporter whose stenographic notes will be transcribed, and a copy of the transcript on the way to the government printing office before the speech of the man who should have an audience but did not is completed.

This is the picture the visitor gets on a day when there is no special debate but only routine business before the House. The inattentive representatives and the empty chairs make a man feel as if Congress and especially his own representative, who was conspicuous by his absence, were not doing their duty properly.

Then, when the visitor gets back to his office in his home town, he opens his morning mail and a copy of the Congressional Record is spread out before him. There, *verbatim et literatim*, is the speech of the man who had no audience, and in the same mail is a copy of a speech made by the representative upon the protection of wool; and the man who has just come back from Washington changes his mind, for he believes in protection.

The great bulk of the work of both branches of our Congress is done in committee. The sense of the House is taken on a subject, and the way a vote will be taken and its final result are in many cases known long before the bill in question comes up. A great many of the representatives were in serious committee session when our visitor was in the gallery. Then others were in their own private offices in connection with their work. There are two great office buildings, connected with the capitol proper by subterranean passages through which an electric motor car carries congressmen back and forth. Committee rooms and private offices are also connected by an elaborate system of telephones. Since their completion in 1910–11 these buildings have greatly facilitated the work of the congressmen.

In the Senate chamber the scene is of a much more dignified character. The senators are as a whole older men than those in the House, and they are more deliberate in their actions and in their attitude while the Senate is in session. There a senator who speaks has the attention of those who remain in the hall during the period of his speech making, but unless an especially forceful speaker is on the program or the subject is of the utmost importance, there is likely to be a sparse audience.

The sessions of both houses open at noon, unless otherwise announced through a pressure of business, as toward the close of a session, when an earlier hour may be chosen. There is a chaplain for the Senate and another for the House of Representatives, and his principal and practically his only duty is to make the opening prayer. Then the business of the day is undertaken, and after roll call the members scatter to attend to their various duties or to do that which pleases them.

HOW DID THE UNITED STATES GET THE NICKNAME OF "UNCLE SAM"?

During the War of 1812 our government had a contract with Elbert Anderson to furnish army supplies, and the inspector appointed to pass on the goods was a jolly man known as "Uncle Sam," his name being Samuel Wilson. He inspected the boxes, and if they were all right marked them with the letters "E. A. — U. S.," the initials of the contractor and the United States. When the marker was asked one day what these letters stood for, he jokingly replied, "For Elbert Anderson and Uncle Sam." This was spread as a good joke, and it became common to refer to all packages marked U. S. as belonging to Uncle Sam.

WHAT IS THE ORIGIN OF THE NICKNAME "BROTHER JONATHAN"?

Once when General Washington needed ammunition, he called a council of officers, and when no one had any suggestion to make, he said, "We must consult Brother Jonathan," referring to Governor Jonathan Trumbull of Connecticut. This patriot helped them out; and afterwards in emergencies it became common to say that "Brother Jonathan" must be consulted. Gradually the government itself was called "Brother Jonathan."

WHEN DID THE FIRST CONGRESS MEET?

See Volume VIII, page 389.

THE STATUE OF LIBERTY

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AS IT STANDS, ILLUMINATED, AT THE ENTRANCE TO NEW YORK HARBOR

This colossal bronze figure, the loftiest statue in the world, was the gift of the French people to the people of the United States in commemoration of the one hundredth anniversary of American independence. Its cost was raised by popular subscription in France, and the statue was executed by Frédéric Bartholdi, a French sculptor. It was placed in position in 1885 and dedicated in 1886. From base to tip of torch the statue is 151 feet, 5 inches high.

CHILDREN ARRIVING AT SCHOOL IN A COUNTRY DISTRICT

WHAT DO YOU KNOW AND WHAT OUGHT YOU TO KNOW ABOUT YOUR TOWN, CITY, STATE, AND NATION?

CIVICS FOR BOYS AND GIRLS

ARE BOYS AND GIRLS CITIZENS OF THE UNITED STATES?

YES, if their parents live in the country and they themselves are born here. When men, women, and children live together in a group it is necessary to form themselves into a political body with a government which shall entitle everyone to the same rights and privileges. Membership in such a local community generally means citizenship. Boys and girls enjoy the benefits of this membership. They also should recognize the duties and obligations which go with citizenship. Being of service to one's community should be one of the highest aims of life.

Some people care so much for the public welfare that they form organizations to help improve conditions in regard to city ordinances, health laws, school work, and the development of parks and playgrounds. Such organizations are often called "civic leagues."

WOULD YOU LIKE TO FORM A JUNIOR CIVIC LEAGUE?

There are certain steps to take if you do. In the first place the leader or leaders should set forth the aim of the association as:

"The object of this League shall be to help keep our school and neighborhood clean and healthy and beautiful."

When the leader has interested a sufficient number of others in the movement, it will be time to draw up a constitution and a pledge. The pledge might read like this:

"I will pledge myself not to deface any fence or building, neither will I scatter paper nor throw rubbish in public places.

"I will protect the property of others as I would my own.

"I promise not to spit upon the floors of public buildings or upon the sidewalks.

"I will protect birds and other animals.

"I will not injure trees, shrubs, or lawns.

"I will try to be a true and loyal citizen."

The constitution might be not unlike this one, though every Civic League would change certain articles to suit the conditions.

THE CONSTITUTION AND BY-LAWS

Article i. Name and Object

Section 1. We shall be known as "The —— Junior Civic League."

Section 2. The object shall be to help keep our school and neighborhood clean and healthy and beautiful.

Article ii. Membership

Section 1. All boys and girls may become members by making known their wish to join, and by signing the League Pledge.

Article iii. Officers

Section 1. The officers shall consist of a President, Vice-President, Secretary, and Executive Committee. They shall be chosen by ballot.

Article iv. Duties of Officers

Section 1. The President shall call meetings to order, call for reports on the violation and the performance of the pledge, and act as leader or captain of the League.

Section 2. The Vice-President shall preside over all meetings in the absence of the President.

Section 3. The Secretary shall keep a record of all reports given, and shall read the reports at each meeting.

Section 4. The Executive Committee shall advise and plan in all matters pertaining to the life of the League.

Article v. Meetings

Section 1. Meetings shall be called by the President, subject to the direction of the Executive Committee.

What shall the League do at the outset?

Before anyone can do much to help the neighborhood and school and community, he must first know what is going on, what others are doing. The following questions will suggest a few lines of activity which cannot but help you in your League work

TOWN AND CITY MATTERS

WHAT DOES THE FIRE DEPARTMENT DO FOR YOU?

YOU have seen the firemen on their bright, shining engines and trucks, dashing down the streets in their fierce haste to arrive at a fire in the shortest time possible. You know that every modern city spends large sums of money to protect life and property. All kinds of apparatus have been invented and built to make the fire department effective. A system of electric signals is in operation throughout all cities of any size, which announces at the nearest fire station that a fire has broken out. Within a few minutes of the receipt of the signal the men and apparatus are at the scene of the disaster. The police have to join the firemen at the time of a fire. The waterworks are at the disposal of the department in order that the hose shall be attached to the hydrants. The streets are given up for the time being to the use of the fire authorities. Besides the regular fire department there is in most cities a protective department, which carries rubber blankets to cover furniture and goods. The firemen must look after not only the building which is burning, but other buildings near by, keeping them wet in order that the fire shall not spread. No department in the city is more necessary. Men have to be very brave. They must be ready at any moment to risk their own lives to save the property of others.

HOW CAN YOU HELP THE FIRE DEPARTMENT?

By taking great care when lighting a fire in a stove or at a camp, or when lighting gas or lamps.

By watching brush fires most carefully.

By following up and finding the cause of the smell of fire or smoke.

By reporting anything that looks wrong in such places.

By learning to use fire extinguishers and other apparatus made for such purposes. (See Volume II, pages 193–204.)

By knowing how to ring in an alarm.

By keeping your nerve and not making a disturbance when a fire breaks out in a public place.

AT A CITY FIRE

Helsingfors, Finland | London, England | Paris, France | Vienna, Austria

WHAT DOES THE POLICE DEPARTMENT DO FOR YOU?

The policeman is a friend of the people. He is expected to serve the needs of everyone in the most efficient way. He stands in the crowded streets to prevent accidents, helping the aged, infirm, and crippled persons, little children and strangers. He is ready to give information and advice if he can.

These officers of the law are always on the lookout for suspicious persons in order to prevent misdemeanors or crime. When a crime is committed, the police have to follow up the criminal and take him to the police station, where he must await trial before a court of justice.

We see policemen before the doors of theaters, concerts, and moving-picture shows, at circuses and where parades and processions are taking place. Mobs and panics are almost always prevented or broken up because of the authority of the police.

Day and night we are protected by this municipal service. We go away in summer, leaving our homes and property without a moment's

Sydney, Australia | San Juan, Porto Rico | Fiji Islands | Puerto Cortés, Honduras

POLICEMEN OF MANY LANDS

Berlin, Germany | Havana, Cuba | Tonga Islands | Santiago, Chile

hesitation, knowing that the police department has special care over empty houses. At night we sleep soundly, with no anxiety as to our safety. The police are patrolling the streets and protecting us in every possible way.

HOW CAN YOU HELP THE POLICE DEPARTMENT?

Answer all questions briefly, accurately, and willingly. Notify the police if you believe anything is wrong and needs their investigation; accidents, disturbances, or possible danger should be reported at once.

Do not stand about in a crowd when something exciting seems to have occurred.

Do not wait when a policeman has to call a patrol wagon.

Do not ask stupid questions. Know what you want and ask politely.

WHAT DOES THE BOARD OF HEALTH DO FOR YOU?

This municipal board helps the family prevent disease and it checks epidemics — that is, it keeps certain diseases from spreading to other

Philippine Islands | Costa Rica | Rio de Janeiro | Buenos Aires

POLICEMEN OF MANY LANDS

families. There are all sorts of inspectors — the plumbing inspectors, who look after the drains and sinks and bowls in the house; the tenement-house inspectors, who attend to proper ventilation in crowded rooms; and other officers who inspect markets, groceries, and fruit stands, in order to condemn unfit food.

The city laboratory is a kind of health workshop. The men in charge analyze milk, water, and ice. They examine microbe cultures, and prepare antitoxins which are used by physicians to prevent persons from contracting contagious diseases, as diphtheria, typhoid, and smallpox. Vaccination is directed by law in order to prevent smallpox from spreading; and by and by laws will be passed in order to check other diseases.

Often in large cities the board of health prints its health ordinances in four or five different languages. This is done to meet the needs of the foreign population. The city also supports physicians and sometimes nurses to look after the health of the school children.

When an epidemic does start in a neighborhood, or when anyone has contracted a contagious disease, the law requires that the health officer shall post a placard on the house, thus proclaiming the existence of the disease. Quarantine follows, not only for the one who is ill, but often for the members of the family. Later, after the house has been fumigated and other precautions taken, the placard is removed.

There is a state board of health which is always ready to help a city in its work. The state makes laws and attends to matters concerning the adulteration of foods and the pollution of streams; and sometimes, in time of epidemic, it quarantines one city or community from another.

WHAT CAN YOU DO FOR THE HEALTH DEPARTMENT?

You can keep clean, take proper exercise, sleep with plenty of fresh air in your rooms, eat wholesome food, avoiding rich foods and candy. Be orderly and neat in your houses. Watch carefully the bread jars, refrigerators, garbage pails, sink spouts, dark cellars, stuffy attics, barnyards, back yards, and all rubbish heaps. Germs breed and flies carry disease from all such places.

Even if you do nothing but fight flies, you will be helping the city to a large extent.

You can explain these things to foreign children in schools. They will tell their parents and so the good work will go on.

Mayors are setting dates for "House-cleaning Days" in some cities. It will grow to be as important as Arbor Day. But every day may be house-cleaning day with members of the Junior Civic Leagues.

WHAT DOES THE STREET DEPARTMENT DO FOR YOU?

We seldom think much about the actual work of these officials except when we find the street blocked or dug up in order to lay pavements, car tracks, gas pipes, water pipes, sewers, or electric wires.

Boys understand more than girls about such constructions. All alike, however, enjoy the benefit of the work, whether in summer when the streets are watered, or in winter when the streets are shoveled and the ice kept safe with sand.

Every city has a street department, not only to build new streets and to repair old ones, but to assist in preserving the health of its people. An army of men with horses, wagons, and all kinds of machinery are at work every day keeping the city clean.

Sometimes towns are not able to build highways for heavy travel. At such times the state becomes interested in road making. State roads are of service to the farmer as well as to the automobile tourist.

HOW CAN YOU HELP THE STREET DEPARTMENT?

By never throwing waste or rubbish in the street.

By taking the trouble to pick up old paper, fruit skins, and the like.

Where cities provide waste boxes and wire baskets on parks and playgrounds for rubbish, not only use them yourself, but teach others to use them.

Take care that the ash barrel does not have

rubbish on its top that will blow into the street.

Do not leave the ash barrel in front of the house after it has been emptied by the city ash man.

Help to make your street beautiful by the care of the lawn, garden, and back yard; if possible, build window boxes and keep flowers blooming in them the year round.

Cities appropriate large sums of money for these places of recreation in order that the people may get out into the open fields and enjoy them. Thus, too, the exercise at the games cultivates comradeship and teamwork. The playgrounds help you "play fair" and "play up to the game." Working together is what all good citizens in the community have to learn to do.

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BRINGING THEIR POTTED PLANTS TO A SCHOOL EXHIBITION

WHAT DO PARKS AND PLAYGROUNDS DO FOR YOU?

Parks are places where you may rest and look at the lovely scenery, with sunshine and fresh air all around you.

Playgrounds give a place for you to enjoy games of all sorts together. Teachers and supervisors show you how to play, and oftentimes lessons are taught, and now and then in the playgrounds there is a story teller who entertains the very "littlest children" when they grow tired of the games.

HOW CAN YOU HELP CARE FOR THE PARKS AND PLAYGROUNDS?

By never injuring the property, trees, flowers, and apparatus.

By never leaving papers and other rubbish upon the grass.

By never teasing the rabbits and squirrels or frightening the ducks and swans in the parks.

By helping little children to understand that these places for recreation should be kept orderly.

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PLANTING AND TENDING SCHOOL GARDENS

WHAT DOES THE PUBLIC SCHOOL DO FOR YOU?

You can answer that question very easily. Some of you began to go to school when you were five. From the kindergarten on through the high school, children have free education. There are 25,000,000 children in the United States, all going to school. Everywhere school committees, superintendents, and teachers are working for the good of the children.

Fireproof buildings are constructed, equipped with the latest ideas in lighting, heating, and sanitation. School doctors and school nurses are appointed in some cities to look after the health in the schools. Then, too, there are all kinds of schools to go to — industrial schools, manual training, commercial, agricultural, domestic science, drawing, and designing, besides the regular primary, grammar, and secondary schools.

There are state colleges for those who wish to go still farther in their education. There are normal schools for those who wish to fit themselves for teachers.

WHAT CAN YOU DO FOR THE PUBLIC SCHOOLS?

Regularity and punctuality in attendance will help.

Care for school property both inside and on the playgrounds.

Coöperate with the teacher both in doing things and getting others to do them.

Try to learn your lessons and be ready and willing to recite.

WHAT DO PUBLIC LIBRARIES DO FOR YOU?

Almost all cities have free libraries with reading rooms where one can go and read, and look at collections of paintings and pictures, interesting relics, and curious specimens.

The children's reading room is often the pleasantest in the library, and sometimes there is a "children's hour" when stories are told to the delight of all.

In some libraries there are rooms for foreigners, with books in different languages, that immigrants may enjoy the benefit of the public reading room.

WHAT CAN YOU DO TO HELP THE PUBLIC LIBRARY?

Take good care of the books.

Be quiet while in the reading room or at the delivery desk.

Interest other children in using the library.

WHAT DO MUNICIPAL UTILITIES DO FOR YOU?

You know there are electric cars which take you into the cities and out into other towns; electric plants for all public and private lighting; gas plants for the same purpose; great sewers to carry away the waste of the city; immense waterworks to provide everyone with water.

Almost always a city owns its waterworks; the other utilities are generally owned by private corporations with which the city negotiates for the use of the same.

By and by the idea of municipal ownership for all utilities will become more popular. It is believed that the electric-car systems when owned by the city will be better and the fares cheaper. So too with the gas and electric lighting. A few cities already own these plants, and there are some cities that have municipal markets and bathhouses and laundries, all run for the good of the people, at the lowest rates possible.

HOW CAN YOU HELP IN THE CARE OF THE MUNICIPAL UTILITIES?

Do not waste water at the public faucets.

Do not throw stones at lamp posts or injure other city apparatus.

Report fallen wires and anything which looks out of order.

Be courteous and quiet on the cars.

Explain to foreign children the advantage of municipal utilities, that they too may help protect what is not only common, but is used by the city for the benefit of the public.

WHAT DOES THE JUVENILE COURT DO FOR YOU?

The old idea was to punish; the new idea is to help people to do better.

Judges believe that it is advisable to help

boys and girls "to do right the next time" rather than to put them into jail for the first offense. So children are no longer tried in the regular court session or permitted to appear with adults in the dock.

No audience is allowed where juvenile courts sit, and the offender appears in court by summons (sent to him) rather than because of a warrant presented by a policeman.

Almost always the courts decide that a first case shall be put upon probation. The probation officer is asked to care for the offender during a certain length of time. The boy or girl who is under probation must report to this officer and follow his guidance.

HOW CAN YOU HELP THE JUVENILE COURTS?

Best of all, do no wrong, so that all courts will be unnecessary for you.

Never try to get another child into trouble.

If you have to appear as a witness in a court, tell the judge the whole story. Be truthful; be accurate.

Do not be afraid to be judged yourself.

If you know a boy who is on probation, try to help him to do the right thing.

WHAT DO THE OVERSEERS OF THE POOR DO FOR YOU?

In olden times beggars and deformed people were to be seen everywhere. To-day, by a regulated system of state and city charity, such people are mercifully taken care of.

There are different degrees of poverty. Money is appropriated to pay officials who take care of the poor and those who are dependent. Assistance is given to aged people, to little children, to cripples, to all those who cannot support themselves, and to the chronic sick and diseased, who have no one to care for them. All such cases are placed in institutions or asylums or hospitals. This is called "indoor relief."

When a person needing care can claim a residence in a town or city, he is supported by the municipality; but if there is no such claim, the state cares for him.

There are many people who need temporary aid. Sometimes misfortune suddenly reduces people in circumstances. The breadwinner of a family becomes helpless. The overseers of the poor in such cases help through the department called "outdoor relief." The help is given in the home; food, fuel, and clothing may be needed for a season. In the meantime, through advice and help, work can be procured.

Organizations supported by churches and the associated charities of cities give much assistance to the municipal work carried on by the overseers of the poor.

WHAT CAN YOU DO TO HELP THE OVERSEERS OF THE POOR?

Keep old clothes in repair to give to the needy.

Do not break toys, and at every Christmastide arrange a box of your former playthings and send it to a children's hospital.

Hold a Christmas-tree party for immigrant children in the school.

Try to write letters to "shut-ins," children at hospitals and asylums.

If you see someone who needs aid, take the trouble to report it quickly to an older person who can help.

STATE AND NATION

So far, you who are members of the Junior Civic League have been asking and answering questions which relate to municipal activities; but you are also in touch with state and national government interests. These employees and officials are at work in cities and towns and everywhere. The postman, the census taker, the customhouse officials, and seamen who patrol our coasts and care for beacons and lighthouses are appointed by federal authorities.

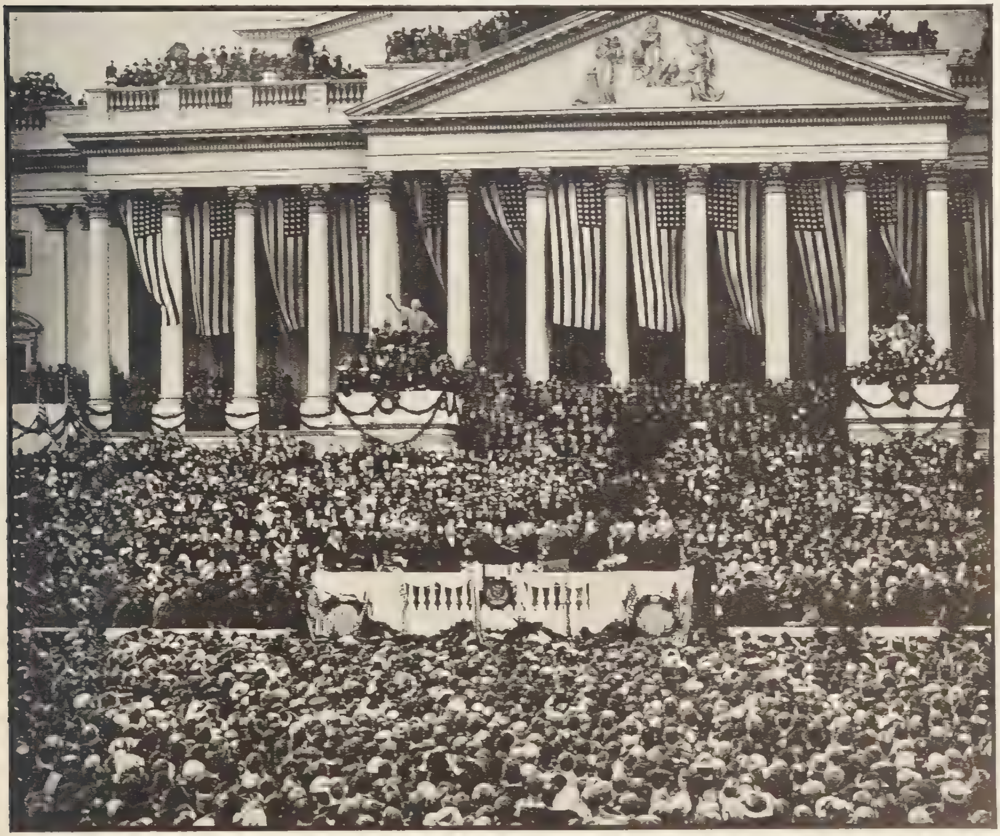
Whether boys or girls are at home or away for holidays, at the beach or the country, there are people in the employment of the state or nation who are working for their good. The rural free deliveries, the parcel post, the reports from the weather bureau, the printed pamphlets that come by mail informing farmers about birds, insects, and animals — all these means of helping the people are the result of work done under the supervision of the federal government.

QUESTIONS YOU SHOULD BE ABLE TO ANSWER

To be intelligent citizens as well as good citizens is part of the duties of the members of Junior Civic Leagues. The questions that follow ought to be answered readily by boys and girls who mean to join a Civic League and keep in touch with the civic improvements:

Who is the President?

Who are the two senators from your state? (You should at least know their last names and one or two reasons why they were chosen to represent the state.) Senators are generally men of superior intelligence and training. As a rule they are chosen for their stable character and dignity. Almost always they have had a large business interest and knowledge of financial matters.



THE PRESIDENT TAKING THE OATH OF OFFICE

Who is the Vice-President?

What party elected these leaders of the government?

(We take it for granted that everyone who reads these questions can answer them; but the following questions may keep you thinking and perhaps searching for the answers.)

Who is the congressman from the district where you live?

(You should know his name, and why he was elected to represent his district in the House of Representatives at Washington.) Every congressman is chosen and elected because the plurality of his party in his district have con-

fidence in him. They believe he will represent their ideas in the House, and that he will vote upon matters according to their wishes. If a congressman should know that his district expected him to vote for the protection of manufactured goods, he would feel obliged to cast such a ballot even if he himself had changed his opinion upon low tariff after he had reached Washington.

WHAT IS THE CABINET?

The group of men appointed by the President who are called secretaries of departments, make up the Cabinet. These secretaries are: Secretary of State, Secretary of the Treasury, Secretary of War, Secretary of the Navy, Postmaster General, Secretary of the Interior, Attorney General, Secretary of Agriculture, Secretary of Commerce, Secretary of Labor.

The work of the ten departments which we have named is organized into bureaus. These bureaus carry out the specified work which belongs to the departments as a whole. The bureaus which would interest boys and girls the most would be the bureau of Indian affairs, geological survey, ethnology, signal service, coast survey, experiment stations, fish commission, and patent office. Those of you who were born abroad, or whose parents were born abroad, know something of the bureau of immigration; and all children who live on farms ought to know that the Secretary of Agriculture has scientific men, working in various bureaus, who are doing everything in their power to help farmers increase their crops and improve the soil of their farms.

We cannot begin to enumerate all the work that the Cabinet controls. The study of consular service alone would entertain you for months. You would learn much of geography while you were following the life and duties of our American consuls while at their posts in foreign cities.

The diplomatic service is even more interesting than the consular service; indeed, each department or bureau of the government has so much of interest attached to it that all good citizens ought to be well informed for their own pleasure as well as their civic duty. (On pages 1–18 of this volume, written more especially for older people, you can find out more about the different departments.)

WHO IS THE GOVERNOR OF YOUR STATE?

(You should know his name and why he was chosen.)

The word "governor" means the "helmsman of the ship," and it is the duty of the governor to see that "the ship of state" moves safely on its course. As chief executive he has civil, military, legislative, and judicial duties to perform.

WHAT IS THE BODY OF MEN CALLED WHO ARE CHOSEN BY THE PEOPLE TO REPRESENT THEM?

In some states this body is called the General Assembly, and in others the Legislature. In Massachusetts it is called the General Court. In each case it is made up of a Senate and a House of Representatives. In America the state representatives must live in their own state and county, and because of this fact there is no reason why children should not be able to know something about the men who are chosen to make laws for the good of the state. The men who are chosen as representatives to our legislature should be chosen because they can be trusted. They should be endowed with wise judgment, based upon experience and training in business or professional affairs.

WHAT IS THE STATE DOING FOR THE GOOD OF THE PEOPLE?

The state appropriates large sums of money for public instruction and the supervision thereof, and it is constantly building good roads, parks, and reservations. It cares for the insane and feeble-minded, deaf, dumb, and blind, and other dependents; and for the insane and for criminals. The institutions which are needed for this charity and penal service are constantly being improved and new public buildings erected for such purposes.

WHAT IS THE CAPITAL OF YOUR STATE AND WHY WAS IT CHOSEN?

How does a capital differ from other cities? Not only does the legislature meet at this

FIREWORKS IN WASHINGTON ON INAUGURATION NIGHT

city in a building called a Capitol, where the governor and other officials have their offices, but all state capitals also possess state libraries, where valuable books are placed for the legislators and for everyone interested in such a library.

WHAT ARE THE DUTIES OF EVERY CITIZEN?

To be ready to serve in the state militia; to be ready to serve as juryman; and to be a willing and honest voter at city, state, and national elections.

WHO IS THE MAYOR IN YOUR TOWN?

(You should know his name and why he has been chosen.)

In most cities the mayor is to the city what the governor is to the state. Of late, however, new charters have been drawn up for some states and the new form of government which they provide gives the control of affairs to a group of men called a "commission" rather than to one individual.

WHAT IS A FRAME OF GOVERNMENT?

A code of laws relating to the government of a group of people is called a "frame of government." We have charters for cities and towns, and constitutions for state and federal government. All such written documents are called "frames of government."

WHAT IS THE CONSTITUTION OF THE UNITED STATES?

It is the frame of government drawn up by the fathers of our nation in 1787. Our country has ever since been governed by this code of laws, together with the laws which have been made by Congress in harmony with the Constitution since it was ratified by two thirds of the states in 1789. One of the significant clauses of the Constitution is, "This Constitution shall be the Supreme Law of the Land." Therefore all charters and constitutions which have been drawn up since 1789 have been shaped to agree with the Constitution of the United States.

WHAT IS THE BILL OF RIGHTS OF THE FEDERAL CONSTITUTION?

The first ten amendments of the Constitution contain important clauses which guarantee for citizens their personal liberty and freedom in religion, speech, and the press; freedom from arrest except on warrant, freedom from cruel or protracted imprisonment, freedom from heavy bail, freedom from quartering soldiers, trial by impartial jury, the right to petition, and the right to bear arms.

WHAT LEGISLATIVE BODY IS THERE IN A CITY?

In some cities there are councilors and aldermen who make up what is called a Common Council. In some towns there is but one legislative body instead of two groups of men. In either case these councilors appoint heads of departments and draw up ordinances for the benefit of the city. As city governments differ in so many details, each city must be studied by itself in order to understand its activities. The officials who are elected to a position in city, state, or national governments have to have their names brought before the public in order to gain an election. Their names are presented by their friends at caucuses or primaries.

Everyone cannot take part in the work of the government. Representatives must do the work; caucuses and primaries are meetings called together for the purpose of deciding what names shall be presented to the public as candidates for nomination for election to office.

WHAT IS AN ELECTION?

After the nominations of their candidates are made by different parties, a day comes when everyone has an opportunity to cast a ballot for the candidates. Elections are under the laws of the state, and they are very carefully supervised. The ballots are sent for by the board of canvassers and carefully inspected. Election returns may be challenged and taken from the board of canvassers to the highest courts in the state to pass judgment upon the returns.

WHAT ARE PARTIES?

A political party is made up of a group of persons holding similar political views and organized for the purpose of controlling all the policy of the government. The most important parties are the Democratic, the Republican, the Socialist, the Prohibitionist, and the Farmer-Labor.

WHAT IS A PLATFORM?

The statement of a policy which a political party promises to pursue while controlling the government, if the party comes into power, makes up the "platform." The "planks" are the pledges included in the platform.

WHAT IS THE AUSTRALIAN BALLOT?

The so-called Australian Ballot system consists of two forms. With the first, the candidates for each office are arranged in alphabetical order accompanied by the name of the party or organization that nominated him. In this case the voter must have sufficient knowledge to follow through the ballot and pick out his favorite candidate. The second form of the Australian Ballot consists of the names of each party printed in a separate column, with its candidates; the voter may cast his vote for all the candidates by simply putting a mark opposite the party emblem. Thus persons who cannot read can make their mark.

In either case the ballots are placed in booths out of sight of other persons, and the voter marks his ballot in secrecy.

ARE THERE OTHER METHODS OF VOTING BESIDES THE AUSTRALIAN BALLOT?

There are not only the old ways of voting by "yea and nay," "raising hands," and "casting balls" or "black ball," but also another method of voting is making headway in the country. It is called "machine voting." Several inventions have been perfected under which a man may vote by going into a booth and pulling a number of knobs, one for each candidate. The advantage is the quickness of the system, for the moment the ballot is completed it is also cast. By and by probably all voting will be done by this method.

IF YOUR FATHER IS NOT A CITIZEN, HOW MAY HE BECOME ONE?

By being naturalized. The requirements of naturalization are as follows:

Five years' residence in the United States and one year's residence in the state where naturalization is sought.

Two years' preliminary declaration of an intention to become a citizen.

An oath to support the Constitution.

Renunciation of all foreign titles or orders of nobility.

Abjuration of allegiance to any foreign power. (Note: No alien can be naturalized if his native government is at the time at war with the United States.)

WHO ARE ALIENS?

There are more than two million people in the United States who have never become citizens of the country, although they enjoy almost all the rights and privileges of our citizenship. These people are called "aliens." A very large proportion of them belong to the immigrant class. Probably many of them will some day become naturalized. If they themselves do not take this step which is necessary to make them United States citizens, in all probability their children will take out papers of naturalization.

When an alien does become naturalized, his children are at once made citizens by his act. His wife must take out papers for herself.

WHEN DOES A PERSON LOSE HIS CITIZENSHIP?

Absolute loss of citizenship as a penalty for crime does not prevail anywhere in the United States, nor do we "expel" our citizens, as is often done in European countries; but under our naturalization laws certain people forfeit their citizenship. When any naturalized citizen returns to the foreign country from which he came, and resides there for two years, it is taken for granted that he has ceased to be an American citizen. Or if he goes to a foreign country other

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FOREIGN-BORN CHILDREN

than his homeland, and resides there for five years, the same penalty is applied. This loss of citizenship is avoided if the naturalized citizen registers with an American consul in the country which he visits.

Citizens convicted of certain crimes, insane persons, and certain others, are however forbidden the privilege of voting.

WHY DO PEOPLE FROM OTHER COUNTRIES KEEP COMING TO THE UNITED STATES?

Many, many people in Europe look to the United States not only for work at better wages, but because they believe that here they will have freedom to think for themselves in religion and in politics. Then, too, they know that in our country education is free, and that there is always a possibility for their American-born children to gain a high position socially if they show evidence of ability and efficiency. An Austrian peasant who farms on a hillside is told that if he takes his family to this country, his sons and daughters may hold high places in the next generation.

While at one time healthy immigrants were welcomed as laborers in factories, mines, subways, and other places where strength, patience, and courage were needed, conditions have changed so that this great influx of foreign people is no longer needed. As a matter of fact, too much immigration is dangerous, because it deprives our own citizens of necessary work. Consequently our government has made laws limiting the number of aliens who may come to our shores each year.

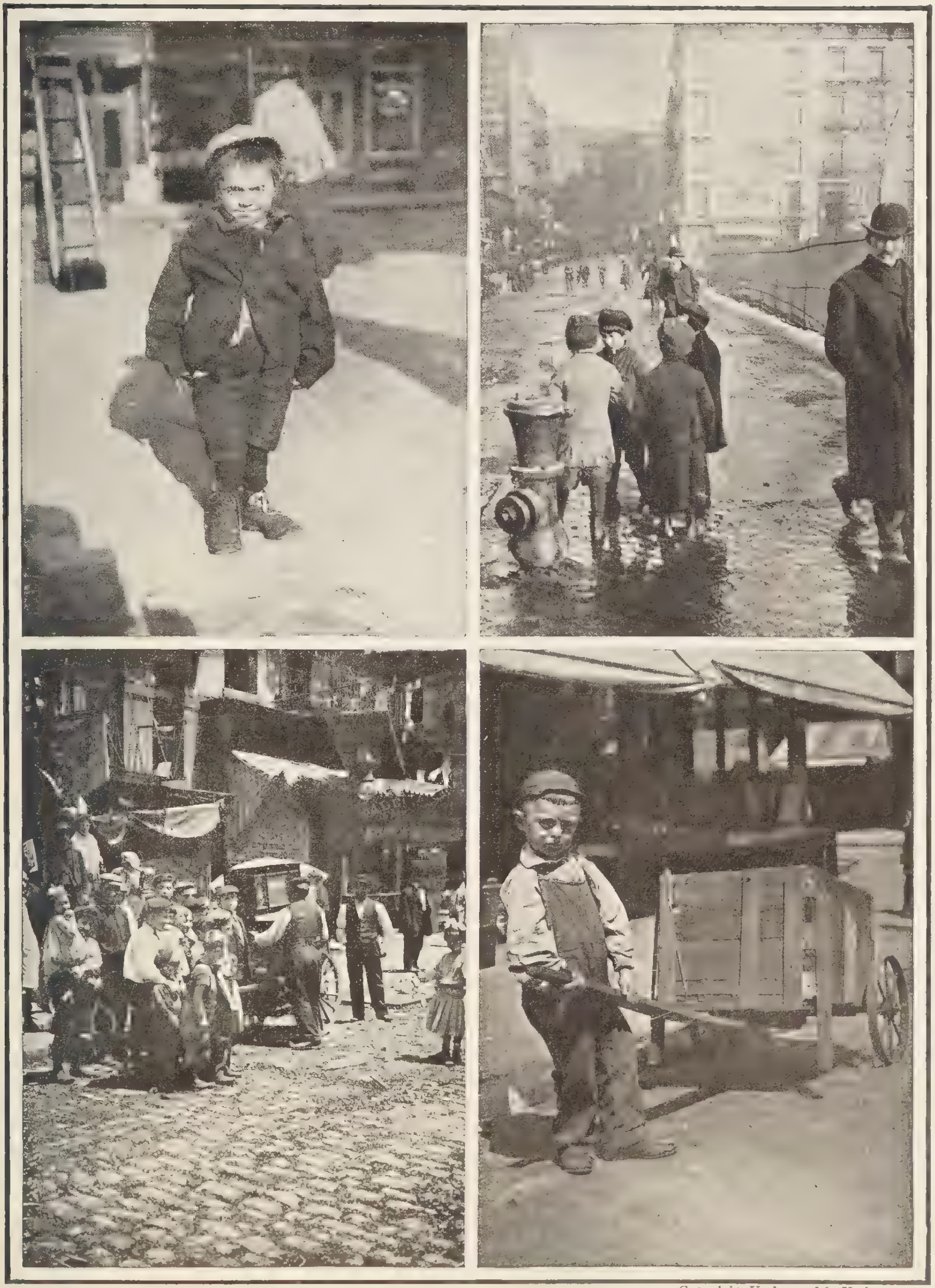
WHAT SHOULD WE DO FOR THESE FOREIGNERS WHO ARE NEEDED TO HELP OUR COUNTRY?

It is not enough to make these foreigners citizens at the end of five years and to give them the privilege of voting. That will not do at all. We must make them loyal, intelligent citizens, men, women, and children ready to serve their newly adopted country in times of peace as well as in times of war.

Our "junior citizens" can do more than older people for foreigners, for they are thrown in contact with the children of these people in the public school. They can assist the alien child to understand how to coöperate in school law and municipal law. They can make these little children from other countries happy by playing with them, by teaching them games, and by asking them to show what they do in their home country. Folk dances in the school playgrounds and folk tales are very helpful, because they give a chance for the foreign child to show what he can do. Then when the foreign-born children and the junior citizens of the United States have become very good friends in the community in which they work and play, the parents will soon follow the example of the children.

WHY SHOULD JUNIOR CITIZENS BE INTERESTED IN CIVIL SERVICE REFORM?

Certainly if you held a position in the government of the city or state, you would not wish to feel that every four years, or in less time, you might lose the position because of party politics. There are two systems of appointing



CITIZENS IN THE MAKING

clerks and government officials. One is called the "merit system," and one the "spoils system."

Where the spoils system is in operation, officeholders are in a state of anxiety at the time of election. The civil service reform has aimed to do away with the spoils system.

The merit system establishes the theory that no one should hold an office who is not entitled to the position, and if he is able to hold it he can retain it as long as he can do its duties satisfactorily. All classified officers pass a competitive examination, and the candidates are chosen according to rank.

WHAT IS TAXATION?

Probably boys and girls know a good deal about taxes which are raised through congressional power, through the right given to the federal government by the Constitution of the United States. But state constitutions prescribe that taxes shall be raised for public purposes; so, too, every municipal government has to levy taxes for the purpose of maintaining its town or city government. Everyone who owns property, either real or personal, is taxed. Not only is there a Federal income tax, but also in many cases a state income tax. To discover the amount and the whereabouts of property is very difficult; so men called "assessors" are authorized by the government to visit every house and inquire particularly into the ownership of a householder's property. Because some citizens are not loyal to the country, they evade or try to evade paying their taxes. In some states there is a penalty for failure to make honest returns, and sometimes assessors are authorized to guess at the amount of property and then to double their guess for the schedule. This method is often kept up each year, the assessment being raised until a man is said to "squeal." We hope the next generation of boys and girls will realize that the more property they have the more glad they ought to be to pay the large tax to support the country.

ARE THERE LAWS TO PROTECT LABORERS?

On all the statute books of the states there can be found ordinances and laws for the protection of the life and limb of the laborer. This has been accomplished by requiring the employer to use safety appliances in mines and factories and other dangerous working centers. Now fire escapes are also demanded, not only at the places of work, but upon all crowded tenements and large buildings. In many states the employer is held liable for damage to life and limb caused by the neglect of such precautions. The conservation of the life of women and children has been much discussed during the last few years. New laws are being made to protect boys and girls and women who heretofore have been laboring in the most tiresome and even dangerous workshops.

Congress has enacted that eight hours shall constitute for all employees in the government service a day's labor. In some states a ten-hour law is common, but the time will come when eight hours will constitute a workman's day all over the country. Members of the Junior Civic League will help to bring this about.

WHAT IS THE INITIATIVE?

The "initiative" is a means by which a given number of voters may on petition require the government to pass a statute of a special kind, submitting it to popular vote; or they may draw up a bill and demand that an election be called and a vote taken upon the bill. It may be used in a nation, a state, or a city, if the constitution or laws permit.

In a city, if a group of citizens can obtain the signatures of five per cent of the voters, the city clerk is required to publish the proposed ordinance. If at the election a majority vote for the ordinance, it becomes law. Thus it is possible for citizens to get such laws as they wish without the control of "political bosses."

WHAT IS THE REFERENDUM?

Oftentimes the city government enacts an ordinance which does not satisfy or suit the majority of voters. In most governments the mayor has a veto on the council, but his veto can be overruled by a two-thirds vote of the council; and, besides, the mayor himself may perhaps have signed the ordinance which does not suit the voters. In such a case the

voters themselves have the right to veto the ordinance which is disapproved of by them. This people's vote is called the "referendum."

Every ordinance as soon as it is passed by the council is published. It does not, however, go into operation until the end of six days. If in the meantime five per cent of the citizens draw up and sign a petition asking that the ordinance be submitted to a vote of all the citizens, the city clerk is required to submit it at a special election to be held a certain number of days after he gives notice. If at this special election a majority of citizens vote against the ordinance, it is vetoed and cannot go into effect. The referendum is used very seldom, and even when it is used it often proves that the majority wished the ordinance which is thought to be unsuitable by those who ask for the referendum.

WHAT IS PROPORTIONAL REPRESENTATION?

The object of proportional representation is to have all parties represented in the board of aldermen in proportion to their number among the citizens. To understand just what the citizens really wish in the way of representation is very difficult where the party influences are fairly well divided. To meet these conditions various schemes of minority and proportional representation have been worked out. Suppose one party had 2000 voters, another 3600, and still a third 4400; then in a board of aldermen composed of ten members the first party should have two aldermen, the second four, and the third party would have not more than four, because this is about as near a proportional representation as such a board could be made. However, such representation is very seldom carried out. The usual method of election is so conducted that the party consisting of 4400 members would hold the power of representation in their own hands, and the other party would have no choice in the government. The original idea of American elections was that everybody must get a clear majority, but at present almost everywhere in the United States a plurality elects, and the result is that the person chosen by his party may have not more than one third of the total vote.

WHAT IS A POLITICAL BOSS?

The popular meaning of the word "boss" is a politician who controls a political organization. A boss may not necessarily be a harmful man of power, yet in the generally accepted meaning of the word he is looked upon as a man who stoops to small means in order to attain great ends. He uses his power to keep his friends in office, and has, as is evident, great power to combine private interests with political issues. For instance, if a political boss wishes votes, and has large sums of money to spend, he can distribute among the poorer class through his political friends thousands of tons of coal, many barrels of flour, boxes upon boxes of cigars, and treat them to picnics and excursions. Is it any wonder that those who receive these gifts from the good-natured political friend are willing to vote for such a "philanthropic benefactor"? If these gifts really came from the man's own private resources, and if he were sincere in wishing to help his political supporters, we should have no right to criticise him; but more often than not the money comes from the public treasury eventually, either directly or indirectly. Even where bosses raise their money from great corporations, the public has to pay for it in the end by the corporations' securing privileges to which they have no right. The boys and girls who belong to the Junior Civic League must learn that the political boss is a menace to popular government. Not only do graft and sometimes political crime grow out of conditions brought about by the political boss, but the fine old ideal of a government "of the people, for the people, and by the people" gets lost sight of altogether.

Our next generation of boys and girls will be wiser than to allow political bosses to rule in the city, the state, or the nation.

WHAT ARE EX POST FACTO LAWS?

A law which goes into operation before it has been explained to the people carries with it conditions which in this country we consider most unjust to the citizens. Hence no such law can be executed here, as it may in other countries. If a new law should be made in connection with shipping and that law not

published but put at once into operation, you can see how much damage might be done to the owners of vessels and to the cargoes which are carried in the vessels. Such unjust execution of the law has never been permitted in this country since the Declaration of Independence.

WHAT IS EXTRADITION?

If a criminal takes refuge in another state (or nation), the state into which he flees must immediately act because of its obligation to the United States and to the state from which the criminal has fled. The usual method is to have a criminal arrested and held for a few days until the governor of the state from which he came may send a direct requisition to the governor of the state in which he is found to authorize his return.

Because of "states' rights," and the fact that laws are different in the different states of the United States, sometimes the governor of one state does not return the criminal after the requisition has been made by the governor of the other state. As yet our Supreme Court of the United States has found no way by which to compel a governor to do his duty if he sees fit to do otherwise. The regulations of extradition between states is something for the junior citizens to think about. It will be a matter for the next generation to adjust.

WHAT IS TRIAL BY JURY?

In this country every man has a right, if he is arrested, to be tried by his fellow-citizens before a judge, with privilege of witnesses; and if his misdemeanor is counted of importance enough to demand the court to sit upon his case, a group of men called "jurymen" are obliged to consider his case and pass their judgment upon it after secret session for consideration.

The difference between a "grand" jury and the jury sitting upon the case differs in a number of ways; the most important is in the fact that the grand jury makes investigations of all kinds relative to the person before his case comes before the court. Indeed, while he awaits judgment, every possible kind of information is investigated by the grand jury. If they decide that the man should be brought before the court, the jury which sits upon the case consists of twelve men who are not allowed to have any information given to them from the outside. Their judgments must be made up from the information brought into the court by the lawyers. This jury is called the "petty" jury. In some states women also serve on juries.

HOW ARE JURORS SELECTED?

Both juries are drawn by lot, and the list of names from which the jurors are selected is made according to state laws. As a general thing enough petty jurors are drawn to supply two or three juries. No one is called upon to discharge this duty oftener than once in a certain period of time, which differs in different places. It is the duty of a citizen to serve as juror when summoned; but many times the men who are called are so selfish that they find excuses which the court accepts, and this sometimes leaves the work in the hands of ignorant and corrupt men.

THE REQUIREMENTS OF GOOD CITIZENSHIP

If we should make a list of the requirements of good citizenship, would the following list of characteristics be satisfactory? And if not, what can the members of the Junior Civic League add to the list?

A willing, active member of a family; helpful, grateful, responsible.

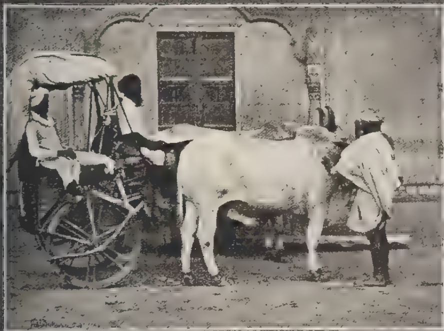
A good neighbor — one ready to serve when asked, and one who anticipates the needs of others and offers service.

An industrious pupil at school — one who obeys the school laws and coöperates with the teacher.

A fine fellow — one who "plays fair," who believes in "teamwork," who "plays up to the game."

A faithful attendant at divine worship — one who, believing in God, wishes to acknowledge Him and show gratitude to Him.

An upholder of the state — one who obeys the laws of his city and state because he knows the government exists for the "common good."



NATIVE CART-CEYLON

NORWEGIAN CARRIAGE

DUTCH GIRL

EGYPTIAN GIRL

NUBIAN WOMAN-EGYPT

A COMPANY OF MOURNERS-EGYPT

ARAB MERCHANT WOMAN

HOW PEOPLE TRAVEL IN OTHER PARTS OF THE WORLD

VEHICLES THAT ARE FAST BEING SUPERSEDED BY MOTOR OMNIBUSES

Left (from top to bottom): Omnibuses in Brussels, Paris, and London, and an old-time English hansom cab. Right (from top to bottom): Omnibuses in Lisbon, Athens, Dresden, Florence, and Copenhagen.

WHY? That is the question man has been asking ever since he came to live on the earth. Why does paper burn when a piece of glass is held at a certain angle between it and the sun? asks the scientist. Why do the stars twinkle, and why do liquids and gases behave as they do, and why were the pyramids built, and why does the sun rise and set? There has never been a time in the history of the world when so many of our "Whys" could be answered as in this twentieth century. That is what this "Quiz Book" and these question pages try to do.

WHY ARE SOME FLAMES YELLOW AND SOME BLUE?

The yellow flame from an ordinary gas burner or a kerosene lamp is made up of particles of glowing carbon which have not been completely burned. In a gas stove air is drawn in from below and mixed with the gas before combustion. On account of this extra supply of air all the particles of carbon are completely burned, and a blue flame results which gives much less light but more heat. Because of the air fed in from below, the flame given off from a hot bed of coals is blue.

WHY DOES A GAS MANTLE GIVE A WHITE LIGHT?

In a burner where a gas mantle is used air is always fed in, giving a nonluminous, practically colorless flame. This heats a white mantle of gauze made of oxides of two rare metals, thorium and cerium, which have taken up all the oxygen they can and will therefore not burn even under considerable heat. Sufficient heat to make the mantle glowing hot is supplied, and a white light results.

WHY DO SOME FLOWERS BLOOM ONLY AT NIGHT?

Such flowers are so constructed that they can be fertilized only by night-flying moths or by other insects which do not fly about in the daytime. Night-blooming flowers are very often large and white, to attract the insects.

WHY DOES AN ENGINE PUFF WHEN IT IS STANDING STILL?

Because an automatic pump is at work filling the air-brake tanks with compressed air. Just after a train has come to a standstill the compressed air is pretty well exhausted from operating the brakes under each car of the train, and the puffing of the air pump is rapid. As the tanks fill, the pumping gradually becomes slower.

WHY DOES A BICYCLE BELL SOUND HIGHER IN PITCH WHEN COMING TOWARD YOU THAN WHEN RECEDING?

The pitch of the bell depends upon the number of vibrations reaching the ear per second. The approaching bell crowds the vibrations on the ear, while the receding bell draws the vibrations out and lengthens them.

WHY DO WE SEE LIGHTNING BEFORE WE HEAR THUNDER?

The crash of thunder is instantaneous with the flash of lightning, but light travels so much faster than sound that we see the flash before we hear the thunder. Sound travels through the air at a rate of about eleven hundred feet a second. The next time you are in a thunderstorm, if you will take out your watch and count the number of seconds that pass from the instant you see a flash of lightning till you hear the crash of thunder, you can tell very nearly how far away the lightning stroke occurred. It is only necessary to multiply the number of seconds by eleven hundred; the result is the approximate distance in feet.

WHAT, we ask, makes the races have skins of different shades? What makes fine yellow hair in the white races, kinky black wool in the black races, and fine or coarse hair, straight and black, in the yellow and red races? We do not feel sure that we know, and yet it is interesting to think about it. And what keeps the old world spinning in the same track, century after century? It is our artist who has asked these questions with his pen, and he answers this one by showing old Father Time turning the world with his sickle.

WHAT MAKES A CAT PURR?

Purring is caused by the breathing of the cat when she is entirely relaxed. Such relaxation occurs only when she is satisfied. Thus cats purr when petted, when going to sleep, or while eating, if they have no fear of disturbance.

WHAT THREE BOOKS HAVE BEEN PRINTED IN ENGLISH MORE TIMES THAN ANY OTHERS?

According to most careful estimates, the Bible, Shakespeare's works, and "Robinson Crusoe." The third may seem to be an odd member of the trio, but as a matter of fact it has proved to be one of the most universally popular stories ever written. It has been translated into over three hundred languages and dialects.

WHAT ARE SOME OF THE OLDEST COLLEGES AND UNIVERSITIES OF NOTE?

University of Oxford, England, founded by King Alfred in 872; University of Paris, about 1200; first college of University of Cambridge, England, 1257; first German university, founded at Prague, 1348; University of Edinburgh, 1582; Trinity College, Dublin, 1591; William and Mary College, Virginia, 1617; Harvard College (now University), 1636; Yale College (now University), 1700, removed from Saybrook, Conn., to New Haven in 1716; Columbia University, founded as King's College in 1736.

WHAT WAS THE FIRST BOOK EVER PRINTED IN AMERICA?

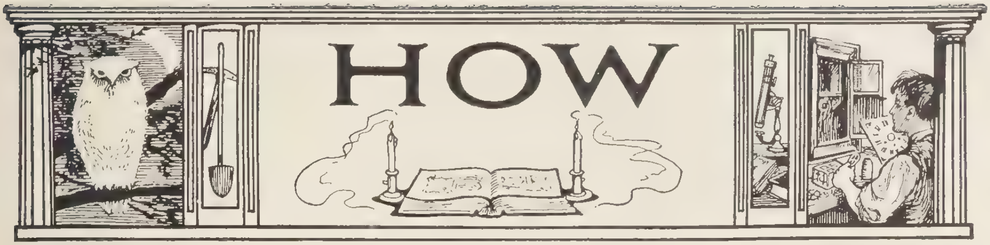
The first book to be printed in the English-American colonies was the Bay Psalm Book, which is now very rare and is much sought after by collectors. It was printed by Stephen Daye at Cambridge in 1640 and was used by the early colonists.

WHAT COUNTRY PRINTS THE MOST BOOKS?

For many years Germany has led the world in the number of books published. In 1911 Germany printed no less than 33,000 literary works. Next came Russia, with 29,000. Japan published 24,000 works, or more than double the number, 11,123, that the United States produced. Then came Great Britain, Italy, France, and Switzerland, with 11,000, 10,929, 10,400, and 10,000 works. Austria-Hungary published 7000; Denmark, Sweden, and Norway combined, 6475; Holland, 3700. Spain and Portugal foot the list, for only 2665 works were published in these two countries. Switzerland published four times as many works per capita as its nearest rival, 2702 for each million inhabitants. The United States published least proportionately of all countries — only 122 books for every million inhabitants.

WHAT MAKES ONE MAN BLACK AND ANOTHER WHITE, AND HOW MANY RACES ARE THERE?

See Volume I, page 290.



HOW FAR CAN THE EYE SEE?

THERE is no definite limit to the reach of our vision. We can see as far as light will travel, but the space between must be unobstructed, and the object must be sufficiently large not to be reduced to invisibility by perspective. We see stars that are millions of miles away. Because of the curvature of the earth's surface we can see only from thirty to forty miles, unless we are on an elevation or looking at a very high object such as a mountain.

An object one foot high can be seen in clear weather 1.31 miles; a 5-foot object 2.96 miles; a 10-foot object 4.18 miles; a 25-foot object 6.61 miles; a 100-foot object 13¼ miles. If a modern ocean liner which was 950 feet long were to be stood on end upon the surface of the ocean, it could be seen at a distance of about thirty-three miles.

HOW CAN LIGHT BE HEARD BY THE BLIND?

It is only in this wonderful twentieth century that the idea has been conceived of translating light waves into sound waves, so that a blind man can read by sound. The particular invention which claims to enable a blind man to read his newspaper by listening to it is called the "optophone." This device consists of a perforated disk which rotates in front of a powerful lamp. The type to be read is placed facing the light upon a rest. A small, intensely bright line of light, passing through the holes in the disk, travels from one letter to the next, and the type reflects the light on a selenium bridge. Each letter gives a characteristic sound, heard by means of a telephone. Learning the sound of each letter, the blind person can follow the text.

HOW DOES THE OPTOPHONE WORK?

It is really the selenium bridge which makes this device possible. To translate light into sound some substance must be used that is affected immediately by light playing upon it. Selenium, a by-product of sulphur, stands alone in having for a property that of changing its resistance to the flow of electricity whenever light strikes it. Using selenium with graphite for terminals for the connection of wires, a cell may be constructed so sensitive that when light falls upon it an electric connection may show the slightest variations and gradations in the light and thus change them into sound.

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A BLIND MAN MAKING A CHAIR FOR PRESIDENT TAFT AT "THE LIGHTHOUSE" IN NEW YORK CITY

AN OLD-TIME ENGLISH BEE SKEP OR STRAW BEEHIVE

HONEY AND THE HONEYBEE

HOW DO BEES KEEP HOUSE?

WHEN left to themselves honeybees make their homes in hollow trees or in the walls of houses or even in chimneys, but when they are kept in apiaries, as bee yards are called, the owners provide movable-frame hives so arranged that the insects may be kept under a certain measure of control. In former times straw hives, commonly called "skeps," were used and are still to be found in parts of Europe. For a long time box hives were used in this country, but they were very crude and there was a heavy loss of bees when the honey was removed. In 1852 Rev. Lorenzo L. Langstroth, a clergyman living in Philadelphia and a student of beekeeping, invented a hive with loose frames, and by so doing revolutionized the honey-producing industry and put American beekeepers at its head. Bee supplies made in this country are now sent over almost all the world.

The modern hive is so arranged that it may be taken completely apart without injury to a single bee. The hive body, which is practically an oblong box, with an opening in front at the bottom, is made in the right proportions to accommodate eight or ten light wooden frames, with two or three wires stretched across each frame. On these frames the bees build the combs which are to hold the honey they store or the eggs the queen bee lays. Each frame, with its comb and with a great mass of bees clinging to it, may be removed at any time through the top of the hive.

The honey which is stored in these combs is left for the feeding of the bees. The beekeeper depends for his supply on surplus honey which is stored in small frames arranged in another box technically known as a "super," this box being set on the hive body in spring when the bees begin to visit the flowers. If the season is good, it may be necessary to use half a dozen supers, one above another, in order to provide room for the honey which is coming in. In this way a hundred or a hundred and fifty pounds may be secured from one colony of bees. A fair average, however, is about thirty pounds a season.

Comb honey is stored by the bees in the pound sections offered for sale in the stores, the supers being filled with these little boxes. Larger combs are used when extracted honey is desired. These combs when filled are placed in a whirling machine, in which they are revolved with much rapidity, the honey being thrown out by centrifugal force.

There is a deep-seated belief that the market is flooded with artificial comb honey, but that is a great mistake. Artificial combs have never been made, and comb honey is always pure. It is true that all honey does not taste alike, but that is because it comes from different blossoms. This is the reason, also, for any

difference in color. The famous sage honey of California is very light, but the buckwheat honey of New York State is dark in color. It is also true that beekeepers supply a foundation which the bees draw out into combs, but this foundation, which is attached to the frames in very thin sheets, is made only of pure beeswax. Otherwise it would not serve its purpose. It is used as a measure of economy, but many pounds of honey must be gathered to make a single pound of wax.

There are, as you know, two classes of bees in each colony — the workers and the drones. The latter are the males; the former, undeveloped females. In addition there is a queen, the only perfectly developed female in the hive. The workers perform all the labor, gathering the nectar, making the comb, acting as nurses for the young bees, and keeping the hive clean. The drones are loafers, living wholly on the fruits of their sisters' toil.

The queen's sole business in life is to lay eggs, and she attends to this business with commendable zeal and regularity. She may lay from two thousand to three thousand eggs in a single day, aggregating in weight twice that of her body. The queen is not the royal personage the writers of fanciful articles would have us believe. She is, indeed, constantly attended by a retinue of workers, and she is fed on a very rich food, termed "royal jelly"; but the reason lies in the fact that the very existence of the colony depends upon her reproductivity, and the bees realize that she must not be hampered in any way. A queen is valuable for two or three years. Workers seldom live more than two months in the busy season. They literally work themselves to death. If new bees were not constantly appearing in great numbers, the colony would quickly be depleted. The drones meet a tragic fate at the end of the season, for then they are either killed by the workers or are driven from the hive to perish of cold and hunger.

CAGES FOR QUEEN BEES

HOW ARE THE BEES HATCHED?

Worker eggs are hatched in three days. Then larvæ appear and are fed five days by nurse bees. The nurse bees seal them over when the five-day feeding period has been completed, and twelve days later full-fledged bees eat their way to freedom. Three days more and they are put to work as nurse bees. Soon after they are dispatched to the fields. If the bees desire to rear a queen, they feed a special food, which induces extra growth and changes the character of the young bee. A prospective queen also has a very large cell drawn out for her. Drone larvæ are fed three days and then sealed for fourteen.

When a bee first emerges from its cell, it is a feeble little insect. It gains strength quickly, however, begins to comb its hair and rub its eyes, and finally starts to eat out of an open cell of honey.

HOW DO THE BEES MAKE HONEY?

What the bees gather from the flowers of garden, orchard, and field is really nectar, which they convert into the honey we eat. Only a minute amount of nectar is secured from a flower, and in its entire lifetime a single bee stores hardly more than half an ounce of honey.

The nectar is taken into the mouth, and by a wonderful arrangement of internal organs is partly changed into honey while the bee is on its way to the hive. Once inside the hive, the insect inserts its head in a cell and deposits its treasure. Cells all around are being filled at the same time, and the bees in the hive set to work to evaporate the excess of water in the thick liquid by rapidly moving their wings, which act like numberless tiny fans. The contributions of many bees are required to fill a cell, but when it is ready it is covered with a capping of wax. There it remains until taken out by the beekeeper, if in a super, or until opened by the bees to be eaten after the flowers have gone, if in the body of the hive. If it is needed by the bees for immediate use, they do not take the trouble to cap it over.

It has been calculated that a quart of honey represents forty-eight thousand miles of flight between the hive and the flowers. With sixty thousand bees in a hive, they may travel a total of four hundred thousand miles in a day. A bee will fly two miles or more for nectar, if necessary, and seems to know by instinct in which direction to start.

The bees gather pollen as well as nectar from the flowers, using it as food for baby bees. A bee has six legs, two of which bear tiny baskets. The pollen grains from the flowers are slightly moistened and at once transferred to these baskets by a most dexterous movement of tongue and different pairs of legs. In early spring thousands of bees having what look like yellow spots on their hind legs may be seen going into a hive. They are carrying pollen to the hive, and sometimes they are so heavily loaded that they lose a portion at the entrance. Beekeepers often feed meal to the bees if pollen is scarce. Sometimes they supply water, too; for if the weather is cold and the bees are obliged to go a long distance for water, they may never get back.

WHY ARE BEES VALUABLE TO ORCHARDISTS?

Of course honey is a delicious and nourishing food, but the value of the honey produced is hardly to be considered when compared with the work of the bees in fertilizing orchard, field, and garden crops. Without bees and other insects which perform a similar service, the world would soon go hungry. Nature has made careful and in some instances highly ingenious provision to make certain that flowers of different kinds are properly fertilized. When a bee enters a snapdragon blossom, for example, the flower closes after it, hiding it from sight. The insect is obliged to rub its back against the part of the blossom which contains the pollen, and some of this pollen is sure to be left on the flower next visited.

In some parts of the world it is necessary to pollenize squashes, cucumbers, and similar vegetables by hand. The owners of greenhouses in which cucumbers are grown in winter keep several hives of bees in these glassed-in gardens, where they may be seen busily at work in the yellow blooms when the ground outside is carpeted with a heavy covering of snow. All flowers are not fertilized by insects, but those which display striking colors or emit a sweet perfume are pretty certain to require their services

WHAT IS SWARMING?

When a colony of bees becomes populous in spring, the insects divide into two parties by a sort of mutual agreement, and one party, with the queen, sallies forth in search of a new home. This is called "swarming," and is the way in which a natural increase is brought about. By providing extra room or by dividing the colonies artificially, beekeepers often prevent swarming, to a certain extent, their purpose being to keep the colonies as strong as possible in order that a large amount of honey may be stored.

After the swarm has left the hive, the bees which remain rear a new queen and go on as before. The swarming bees alight on a tree or shrub close at hand and send out scouts to seek permanent quarters. Meantime the swarm hangs in a great cluster, the bees clinging to each other, and at that stage of the proceedings it is easy to capture them. The beekeeper simply sets an empty hive beneath, with a sheet spread in front, and either saws off the limb or shakes the insects from it. If the swarm is very high, a device on a pole may be used to make the capture. The queen is usually in the center of the mass, and when she runs into the hive the other bees always follow.

Then the hive is carried to its permanent quarters.

The bees are easily handled at swarming time. They are good-natured and seem to look on the experience as a sort of holiday lark. Moreover, they will have filled themselves with honey just before leaving the hive, and in that condition cannot easily bend their bodies to sting. It is necessary to hive a swarm of bees within a short time after they take their departure, for otherwise they will sail into the air again and perhaps travel several miles to the new home selected by the scouts.

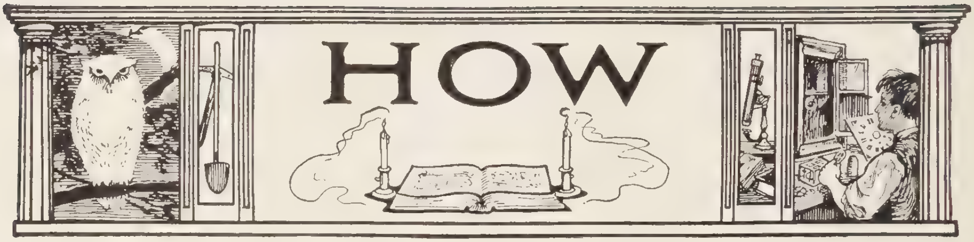
HOW MANY BEEKEEPERS ARE THERE?

Probably three hundred thousand people in the United States keep bees. Fifteen factories are given over to the manufacture of apiarian supplies, and several papers in the interests of beekeepers are published. The annual honey crop is valued at from ten to twenty million dollars. Many tons of the cheaper grades of honey are used by the great baking establishments of the country in the making of cakes and cookies. Honey has the peculiar quality of causing bake stuff to keep fresh and moist for a long time, besides imparting a pleasing flavor.

There are comparatively few people who give their full time to beekeeping, although several men own a thousand or more colonies. Most apiaries contain from two to fifty colonies. In many sections there is not sufficient pasturage for more than half a hundred colonies. Not a few suburban residents maintain several colonies in their back yards. This is a perfectly feasible plan, and the initial expense need not be over fifteen dollars. A colony of bees in a modern hive with a super may be purchased for ten or twelve dollars. Gloves, a veil, and a smoker, together with a few other simple accessories, will be sufficient at first. The smoker is important, for smoke blown gently into a hive demoralizes the inmates and renders their manipulation easy. Only Italian bees should be kept, as they are much gentler than the black or German bees and are excellent honey makers. Several other kinds of bees are known in this country, but are not common.

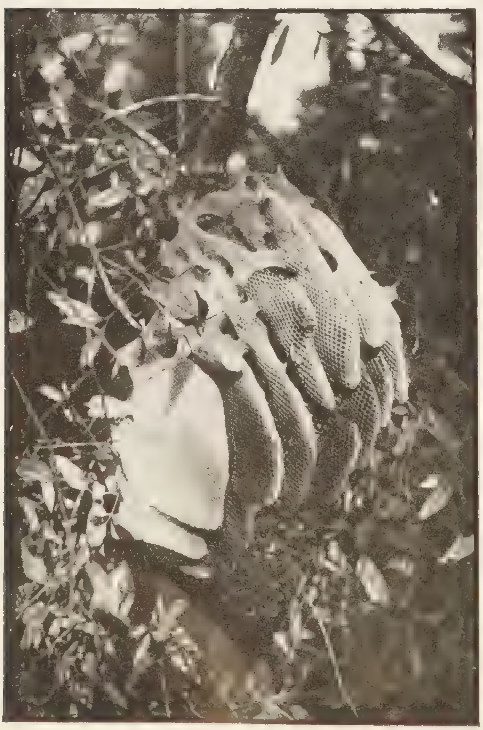
EXAMINING THE FRAMES IN A MODERN HIVE

For pictures of bees swarming and of a man doing the pollenizing work of a bee, see Volume III, pages 320 and 323.



CAN A BEE STING TWICE?

WHEN a honeybee stings a person, the sting remains in the wound and the bee soon dies. It can sting only once. A bumblebee, on the contrary, withdraws its sting and can use it many times. If the sting of a honeybee is immediately rubbed out of the wound, little ill effect will be felt. If allowed to remain, it will continue to work into the flesh, while it keeps pumping in poison. The sting of the queen bee is curved, while that of the worker is straight.



BEES LIVING ON COMBS BUILT IN THE OPEN AIR

WHAT IS THE CUSTOM OF "TELLING THE BEES"?

"Telling the bees" is an old English custom. On the death of a member of the family, the bees were told at once, and their hives draped with mourning. It was believed that if this were not done, the bees would leave their hives and seek a new home.

HOW LONG DO SEEDS RETAIN LIFE?

Some seeds retain their vitality for years, but others lose their power to grow after a few months.

HOW DOES A CRICKET CHIRP?

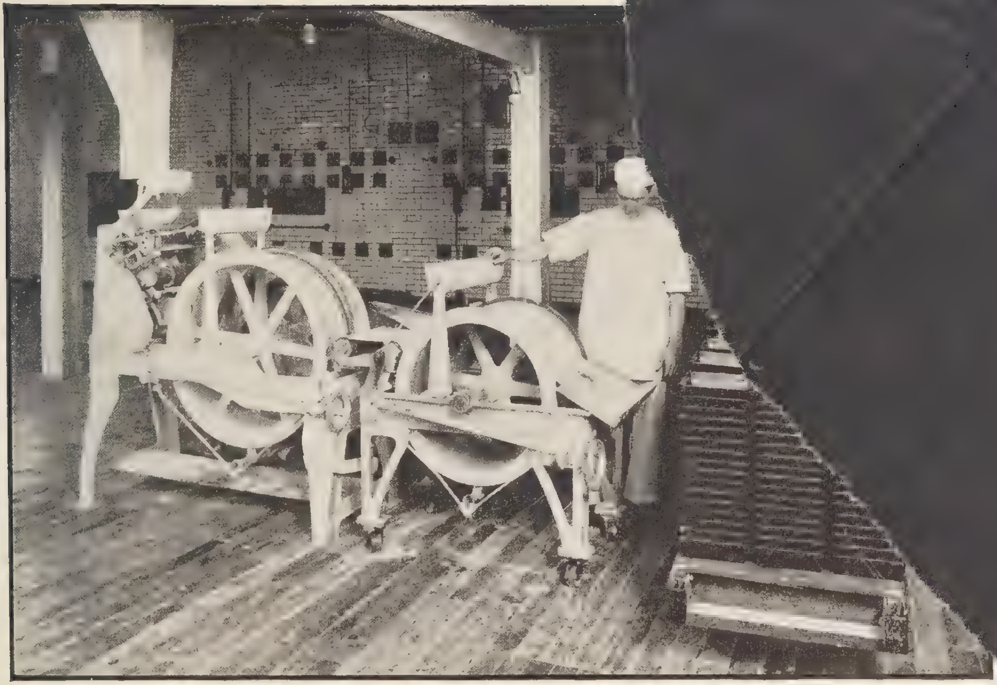
By rubbing his fore wings on his hind wings; there is a little drum in the middle of the fore wings that is sounded by sawlike ridges on the hind wings.

HOW CAN A SOFT PLANT PUSH THROUGH A TAR WALK?

Each plant cell during its growth exerts an enormous pressure. Often this pressure equals that of a steam boiler. The plant uses this power to push aside any obstacle in its path. Sometimes huge rocks are split apart by the expanding force of roots growing in the cracks.

WHAT WILD FLOWER GIVES ONE BLOSSOM TO THE FLOWER PICKER AND KEEPS ANOTHER UNDERGROUND FOR ITSELF?

The fringed polygala has a curious underground flower which ripens its seeds by self-fertilization. In this way new plants are insured; for if by any chance the upper flower should fail to produce seeds, the groundling seeds would sprout anyway.



THE MACHINE IN WHICH BREAD IS SHAPED FOR THE TINS

BEHIND THE SCENES

IN A BAKERY

YEARS ago every housewife baked her bread, just as she carded her flax and spun her yarn. She had no other way to get it. Now in every city and almost every town there are professional bakers who bake from three hundred to ten thousand and one hundred thousand loaves a day. Whatever else they may eat, everyone must have bread of some kind, and as the kinds vary with every nationality, the bakers in our larger cities must be able to supply eighteen and twenty varieties. In the poorer neighborhoods the kinds made with water are in demand, because they have the greatest bulk. People of means are more likely to buy bread made with milk, although the loaves are smaller. Germans, Swedes, Italians, and other foreigners call for the peculiar varieties with which they are familiar. There is always a certain call for whole wheat, graham, gluten, and raisin breads. Restaurant keepers want French bread, which comes in long loaves and has a thick, hard crust. Hotel chefs ask for a soft bread with very little crust, because it is best adapted to toasting. To meet these demands an intricate business of enormous proportions has been built up by the great baking concerns.

HOW IS THE BREAD MADE?

When business is done on such a large scale, most of the work is performed by machinery. First the flour is screened through silk fabric. Several brands are blended during this process in order to get a uniform mixture. Then it goes into enormous mixing machines, where it is combined with other ingredients, including either milk or water, and stirred by great iron arms.

BREAD JUST FROM THE OVENS TRAVELING ON AN ENDLESS BELT TO THE SHIPPING ROOMS

When the mixing process is completed, the dough is emptied into large steel receptacles mounted on wheels, and set away in a special room to rise. A man with a thermometer takes its temperature occasionally, and at the right moment it is wheeled into another room and deposited upon a curious machine which weighs out the precise amount required for a given kind of loaf and neatly cuts it off. Another machine then takes it and performs the process called "kneading," which the housewife must do with her hands. When the balls of dough are ready, they are slipped into pans piled on a wheel rack. These are trundled away to a steel-lined room filled with steam, where the temperature is kept at one hundred degrees Fahrenheit the year round. Here the dough gets its second "rising," after which it is ready for the ovens.

IN THE OVENS

Every large baking concern has a long battery of huge ovens, each of which will accommodate from three hundred to three hundred and fifty loaves of bread at one time. The ovens are built of brick and the walls are made very thick, in order that they may hold the heat a long time. Often the fire is permitted to go out for a day or two, but at the end of that time the bakers must still watch the ovens carefully or the bread will be burned. Bread could be baked satisfactorily after the fires had been extinguished a week, so well do the brick walls hold the heat. Each oven is illuminated by a powerful electric light in order that the baker may see all parts of it. Before the loaves are removed the oven is flooded with steam for a few minutes for the purpose of giving the crust of the bread the glossy appearance which we all like to see and which the housewife secures, when she makes bread in the kitchen range, by rubbing it over with butter or with cold water.

PREPARING THE BREAD FOR DISTRIBUTION

Bread should be distributed as soon as possible after it is baked. But in the business of distribution the baker meets, as he has met at all stages of the preparation, the problem of insuring absolute cleanliness. If we are to allow our bread to be made outside our homes, we must be certain that it is made and handled under healthful conditions. In many modern bakeries absolute safety in distribution is obtained by labeling and wrapping each loaf separately. To do this an ingenious machine has been devised into which the loaves are fed as they come from the oven, and from which they issue completely wrapped and sealed, ready for the delivery wagons. In some shops the loaves are placed on an endless chain belt as soon as they come from the oven and carried to the wrapping room. Besides the local delivery

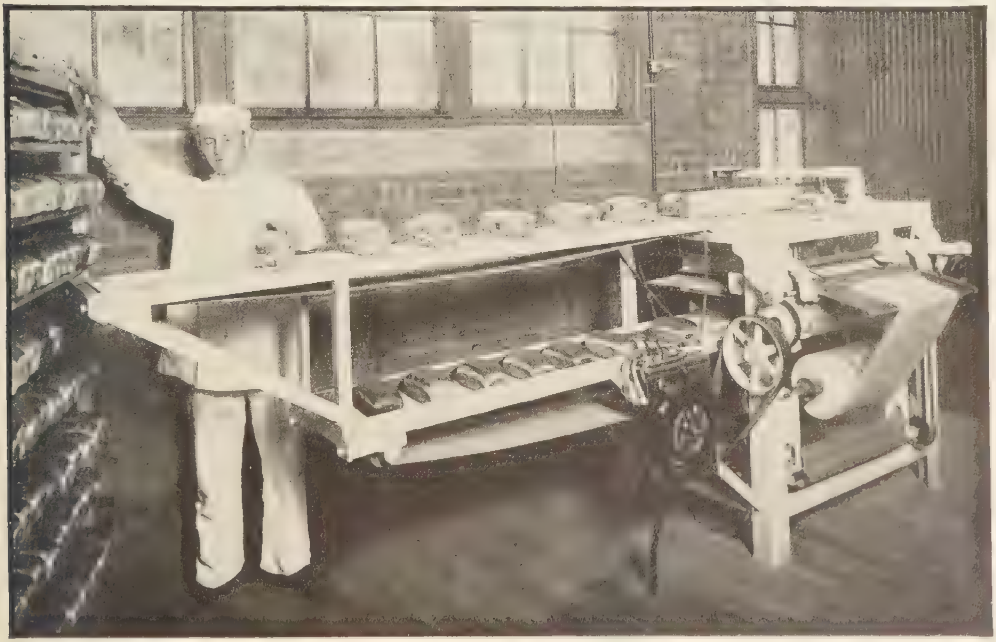
in wagons, huge baskets of bread are shipped by train to places hundreds of miles away.

WHAT KINDS OF BREAD ARE EATEN IN OTHER LANDS?

Each nation has its own special bread and wonders how people can eat any other kind. The German peasant considers our white bread insipid in comparison with his great black loaf, which is always sour. It is a custom in German villages to have a single large oven to which each housewife may take her batch of dough. These ovens will often hold fifty or sixty loaves. In Finland the old custom was to have one baking day in the year, when a great number of rye cakes were made up, each with a hole in the middle through which it could be strung on a cord and hung up until needed.

In Central America, Mexico, and even in parts of the United States the tortilla is the principal article of diet. It is made of corn meal and water and worked with the hands into exceedingly thin wafers. These wafers are baked one at a time on a sheet of metal over a bed of coals or even on a hot stone, and when a dozen or so have been placed in a pile, they are rolled up and eaten. The Pueblos of New Mexico make what are practically tortillas, although white visitors call them sheets of "paper bread." They are really almost as thin as a newspaper. The squaws like to color them red, blue, or green, thinking that this makes them more appetizing.

Strange materials are sometimes used in making bread. Icelanders make flour from reindeer moss, which is dried and pulverized. Beans, acorns, and roots are used in various parts of the world. Some of the Indians in the western part of our country make acorn flour. In parts of Europe fish meal is added to barley meal. It is a common practice in the United States to use potatoes in white bread. Rye and barley bread are popular with European immigrants, and many of them like caraway seeds in their bread. Tests seem to show that the white wheat flour bread is the most digestible of all kinds, but whole wheat bread has a flavor and substance which gives it wide popularity.



WRAPPING BREAD

WHO WERE DESCARTES, HUMBOLDT, AGASSIZ, AND PASTEUR?

Top (left): René Descartes, a French philosopher (1596-1650), who made great contributions to philosophy, physical science, and mathematics. It was Descartes who said, "I think; therefore I am." Top (right): Friedrich Humboldt, a German traveler and naturalist (1769-1859), whose book "Cosmos" is one of the most valuable works of science ever published. Bottom (left): Louis Agassiz, a Swiss and American naturalist (1807-1873), who came to Harvard in 1848 and made wonderful contributions to biological knowledge. Bottom (right): Louis Pasteur, French chemist (1822-1895), who is often called the founder of the science of bacteriology. (See also Volume IV, pages 394, 395.)

Courtesy of Canadian Pacific Ry.

CANADIAN PARLIAMENT BUILDINGS, OTTAWA

These beautiful sandstone buildings are on Parliament Hill, 125 feet above the river. The foundation stone was laid by King Edward VII (then Prince of Wales) in 1860.

HOW IS CANADA GOVERNED?

IT is a remarkable fact that North America has two systems of government of the people, for the people, and by the people, differing widely from each other, yet each operating with marked success. At first sight the United States and Canada seem much the same sort of nation, where freedom and a directly representative government are the foundation of a great state. Yet on closer investigation the machinery of the Canadian government shows a mode of operation that is very distinct from that of its great neighbor.

HOW DOES ITS SYSTEM DIFFER FROM THAT OF THE UNITED STATES?

They are alike in their distinction between the executive, the legislative, and the judicial divisions of government, which is nowhere more clearly recognized than in these nations. They are also alike in their working out of these divisions; the executive being composed of a chief and his cabinet; the legislative, of two representative houses; the judicial, of a supreme court and subordinate courts.

They are unlike in that the President of the United States holds office for a definite term of four years, during which he may be removed only by impeachment, a proceeding that is extremely rare. On the other hand the Canadian Premier, as the chief executive is called, together with his Cabinet, are forced to resign whenever his party is decisively defeated in Parliament on an important measure. This is a distinction that produces far-reaching results, as will appear in what follows.

Modeled upon the English methods of Parliamentary government, the Cabinet is the all-

important feature. In it the measures to be submitted to Parliament for legislation are drawn up, and through it the laws are put into execution. It is selected by the Premier from the ablest men of his party. Their ability must be unquestioned, as upon him and them will rest the responsibility for all that transpires during their control of the nation. Should this Cabinet fail to give satisfaction to Parliament either in its administrative policy or in the measures introduced for legislation, it must resign, it has no alternative. An election for Parliament follows, in which the people choose their representatives and at the same time practically elect a new Premier.

The effect of this mode of government has been to promote attacks upon the Cabinet and party in power, for the purpose of defeating them and thereby causing an election in which the party out of power hopes to gain either the control or else an advantage.

The party in power is known as the "Government," and the party out of power as the "Opposition." The general party issue is that of conservative versus progressive, on which they base the platforms or principles of legislation that each upholds. As a result of this party system, political feeling is apt to run very high and comparatively trivial matters are presented to the public as issues of overwhelming importance. In fact, it sometimes happens that the Opposition attacks legislation which it has previously supported, simply because it is introduced by the other party. An instance occurred not many years ago in England, when the Conservatives, who had declared themselves in favor of national insurance legislation during an election, none the less opposed such legislation when introduced by the Liberal Government. This inconsistency was wholly due to the party system.

In spite of these apparent exaggerations and other obstacles to calm administration, it is again and again made clear that the mode of popular government employed in Canada is genuinely representative of the people and conforms to their opinion and desire. In fact, it is claimed with a good deal of justice that the public have a more direct influence on legislation in this way than is the case in any other form of republic.

THE GOVERNMENT

The representative of the British Empire is the Governor-general, sent out from the central government at London for a term of five years. Although possessing the veto power over such measures as he may consider opposed to the interests of the Empire, and also having the power to assemble and dismiss Parliament and choose the Cabinet, his actual authority is very slight, as he exerts his power only under the direction of the nation. His choice of a Cabinet, for example, is that indicated by the Premier, who, in turn, is nominated by popular vote.

The Cabinet has already been dealt with in the main. The duties of its members correspond on the whole to those of the United States Cabinet.

The Parliament consists of two "houses." The upper house, called the "Senate," consists of a number of members proportional to the various provinces and to their importance in the Dominion. They are chosen for life. It is very rare that the majority in the Senate is opposed to the Government. If it does happen, legislation may be blocked by this condition.

The lower house, known as the "House of Commons," consists of a number of members proportional to the population and directly elected by the people. With them rests the main legislative power, and all measures for consideration are introduced here. Members of both houses receive $4000 a year and traveling allowance. All powers not assigned to the lesser legislative bodies of the provinces are retained by the central Parliament.

The judiciary consists of the Supreme Court, to which appeals may be taken from the lower courts, which are held throughout the Dominion. Appeal may be made under certain circumstances to a committee of the Privy Council of the Empire, in London.

Although acknowledging the supreme authority of the British Empire, of which it is a part, Canada is in reality practically independent of the mother country. She may be called on for help in times of stress, or otherwise invited to participate in the action of the various states constituting the Empire, but otherwise she is left to herself. Her responsibility is to herself even more than to England.

CANADA'S PLACE IN AMERICA

(*By J. A. Macdonald, LL.D.*)

NORTH AMERICA, like ancient Gaul, is divided into three parts. The United States, in the center, holds the premier position. To the south the Republic of Mexico, at war with itself, is as yet a menace to the peace and prosperity of the continent. To the north the Dominion of Canada, sharing almost equally with the United States the entire land area between the Mexican boundary and the arctic, is growing into virile nationhood, well knit, resourceful, and making ready for its part in justifying America's first promise to the world.

For four hundred years America to the world has promised opportunity. Age after age millions of the ambitious and the oppressed in the nations of Europe yearned westward beyond the Atlantic sky line. Generation after generation they made the great adventure. From Britain, from France, from Spain, from Italy, from the states of the German Empire, from the little southeastern kingdoms, from the steppes of Russia, and from the land of the sturdy Norse — from every European cradle of liberty the children came, and they still come. Columbus, Cortez, Cartier — they and their adventurous kind were only the forerunners of a mighty host to whom America meant opportunity. To such straining eyes and eager souls this new continent with its new chances still means opportunity.

MEANING OF THE UNITED STATES

In North America the United States means independence. The great Declaration made plain to all the world that, within the range of the Anglo-Saxon impulse, and at least for the peoples of the English speech, any colony anywhere that cherishes national aspirations and desires national independence must be allowed the rights and responsibilities of national self-government. That is the dominant and permanent meaning of those events which issued in the political separation of the thirteen American colonies from the throne and sovereignty of Britain. All other questions and issues were incidental and subordinate. That one lesson — the lesson of national independence and self-government as the inalienable right of any people with capacity for nationhood and desiring national autonomy — that lesson in world politics the American colonies taught, not alone to the Britain of the eighteenth century, but also to the United States of the twentieth century, and to all colonizing nations the world over and for all time. That lesson had to be learned. History at that time knew of no other way by which it could be taught, none but the chosen way of separation. The separation of the American colonies into the United States of America was in the eighteenth century inevitable. It brought disunion and division into the English-speaking world, but it taught the lesson of political independence and self-government, which, in the new democracy of the world nations, are at the essential basis of all vital and permanent international unity.

WHAT CANADA HAS DONE

In North America, Canada to-day takes up the parable of the United States of the eighteenth century and carries it forward. Canada stands not for national autonomy alone, but for imperial integrity, for Anglo-American fraternity, and for the broader international unity. A divinity shaped the ends of Canadian confederation in 1867 as truly as of American independence in 1776. A Power that was not man's power, in the one case as in the other, guided both nations into ways they knew not and to issues of which they had not dreamed. But in the end it will be seen that the ways were one way, the way of Anglo-Saxon liberty, and that the issues were one issue, the larger issue of Anglo-American unity. Discords rushed in that the harmony might be prized. The discords of the eighteenth century will be understood in their wider significance, and the harmonies they introduced will be justly prized when the twentieth century affirms the part which Canada is destined to play in the international relations of the English-speaking world.

The thing done in Canada's history, the unique, original, epoch-making thing, was to prove that any colony of any empire, having come to maturity, may achieve national

independence and self-government without severing the imperial tie. Never before had that thing been done. For the sake of national autonomy the American colonies sacrificed their historic background. When the resolutions of the Quebec Conference were framed into the Act of Confederation and passed by the imperial Parliament in 1867, there were those who feared that the Canadian provinces would pay for their national standing the same old price of separation. Beaconsfield and Gladstone so feared. They saw no alternative. Britain, they thought, must suffer another schism. Independence would have been Canada's for the asking.

But to the fathers of Canadian confederation came another vision, the vision of liberty, not by national separation, but through the larger democratic imperialism. Dimly they saw it, fitfully, and from afar. Self-government for the new Canada they indeed must have. They sought it, and found it, and finding it found the new secret of empire.

THE NEW IMPERIALISM

For the British Empire on the old lines of the Roman imperium there could be no future. Centralized authority with overseas subject states could not survive in the free atmosphere of the world's new democracy. The times of George III gave place to the times of Queen Victoria:

> "Statesmen at her councils met,
> Who knew the seasons when to take
> Occasion by the hand and make
> The bounds of freedom wider yet:"

and in that wider freedom Canada achieved national self-government without cutting the imperial tie. That new achievement meant a new empire. Empire was emptied of its old and arrogant imperialism. It came to mean, and it now means, the new alliance of free nations which with the mother country makes up what the world calls the British Empire.

WHERE CANADA LED

That absolutely new thing in the political history of the world was made possible when Canada came to national standing within the British Empire, administering her own affairs, enforcing her own laws, determining her own tariffs and treaties, and deciding for herself who shall and who shall not be granted the franchise of her citizenship, and doing all these things as her national right within the new imperial circle. Canada having blazed the trail, there followed the Commonwealth of Australia, the Dominion of New Zealand, the new Dominion of South Africa, and the Irish Free State. The overseas dominions, with the self-governing colony of Newfoundland, find their truest nationalism in glad loyalty to the imperial idea and under the Union Jack. Who can tell but that in this new century the Philippines, if they come to national unity and manifest the Anglo-Saxon instinct for self-government, will learn from Canada's experiment, and will find their highest national independence, not in national isolation, but as a self-governing dominion under the Stars and Stripes?

CANADA AND AMERICAN PROBLEMS

In North America, Canada rises into nationhood to share with the United States the obligations of American civilization. In matters of land area and of national resources these two nations, holding sway from the Gulf of Mexico to the North Pole, have each enough and to spare. Neither need covet the possessions of the other. There are problems to be solved large enough and serious enough to tax the ingenuity and statesmanship and patriotism of both countries. Each has its own problems; but they have other problems in common, problems in social life, in economic life, in political life, in national life, the solving of which will require the combined wisdom and energy of both nations.

There are problems, too, involving other nationalities with which both the United States and Canada shall have to do. As joint heritors in America of a common civilization, with its common laws and literature and institutions of government, they cannot evade responsibility for the freedom, integrity, and peace of the Latin republics on this western hemisphere. Not the Monroe Doctrine alone

but the inescapable obligations of Christian citizenship involve these two free nations in high concern for the unity and consolidation of Mexico and of all the turbulent republics of Central and South America. The supreme national interests of the United States and of Canada will be served only when freedom of life and stability of government come to each of the other countries, sharing with them the privileges and duties of the western hemisphere. Among the nationalities of the new Pan-Americanism Canada must stand up and be counted.

CANADA PLUS BRITAIN

Canada counts for more than one. In the North American situation Canada stands for more than Canada alone. Because of Canada's imperial relations the power of North America to-day is the power of the United States and the power of the Dominion of Canada plus the power of the world empire of Britain. As a distinguished American statesman has said, were Canada either a separate sovereignty or state in the American Republic there would be for North America no plus. Canada is the hostage of the British Empire in America. It is the bond and the pledge of the Anglo-American unity. Because of Canada's unique position as the halfway house of the British Empire and the half-continent neighbor of the United States, the fortunes of the English-speaking nations the world over are bound up together in one bundle of life.

CIVILIZED INTERNATIONALISM

For a hundred years the United States and Canada have joined in presenting to the world an example of civilized internationalism in North America without precedent or parallel in any age or on any continent. Across this continent from ocean to ocean there is stretched for four thousand miles of river and lake and open plain and mountain gorge an international boundary line unbarbarized by either fortress or battleship and unmenaced by any thought or fear of war. That international fact is unmatched anywhere in all the rest of the world. It is America's greatest message to the nations. It affirms the doctrine of the world's new democracy: that a nation's real security is not in the might or the power of brute force, but in the character of its people, in the unity of their national life, and in the worth of their national purpose. Canada, with only eight millions of people, and with neither standing army nor even the beginnings of a navy, and next door to the United States with its ninety millions, holds half a continent in a peace the militarized nations of Europe never knew. The defenses of American internationalism are not in steel plate and long-range guns, but in the civilized feelings and ideas and standards of America's international democracy.

The scaremongers tell us that a struggle is coming on the Pacific. But if it comes, and if it comes on the Pacific, it will be one struggle all the way from San Diego and the Mexican frontier to the snow fortresses of the Yukon. There can be no "Yellow Peril" on the Pacific threatening any one English-speaking interest alone. Those interests are the common responsibility of the four English-speaking Pacific nations — the United States, Canada, New Zealand, and Australia. Back of California and Oregon and Washington stands the Republic of the United States. Back of British Columbia and the Yukon stands the Dominion of Canada. Involved with Canada are the British dominions in the southern Pacific, and back of Canada and Australia and New Zealand stands the whole British Empire on all the Seven Seas. The Anglo-American unity is one and indivisible.

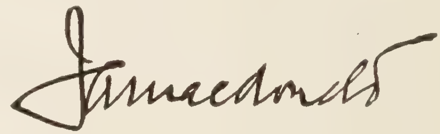
"In the day of Armageddon,
In the last great day of all,
Our house shall stand together
And its pillars shall not fall."

THE CONFLICT OF IDEAS

But the Armageddon of the Pacific, when it comes, will be a conflict of ideas against ideas, life against life, citizenship against citizenship, civilization against civilization. The Armageddon of the Pacific is now on. In it we wrestle, not against flesh and blood, but against principalities and powers that were venerable before the Anglo-Saxon was born. The weapons of that warfare are not carnal, but spiritual.

When East and West stand face to face, that civilization will survive which justifies itself in the things of the spirit, in the range of its intellectual horizons, in the moral integrity of its life, and in the supremacy of its spiritual achievements.

In the great days to come Canada's truest service to the defenses of North America and to the stability of English-speaking civilization will be, not by the old instruments of brute force either on land or on sea, but by promoting social justice, by establishing political freedom, and by making Canada's impact on the nations wholesome, helpful, and true. Schools, universities, and churches; a free press not blinded by local prejudice and not warped by sinister influence; fair play in industry and trade; a just division of life's burdens and a just distribution of life's rewards; the strengthening of all the agencies of peace and good will that help to change the world from a jungle to a neighborhood; and the framing of international policy in the terms, not of envy and fear, but of love and service and a sound mind — it is by these things Canada would vindicate its place among the nations and play its part in justifying America's promise to the world.



WHAT IS AN EMPIRE?

An empire consists of a group of nations or states united under a single sovereign power. For example, England, Canada, Australia, and Gibraltar are all members of the British Empire. Many of these divisions are almost independent and govern themselves, as we have seen in the case of Canada; others are governed from England. The control over all the British possessions is in the hands of the English government, which consists of a Parliament very much like the Congress of the United States and elected in much the same way, together with a Prime Minister and a Cabinet whose duties correspond to those of the President of the United States and his Cabinet.

WHAT IS A MONARCHY?

A monarchy is a state under the rule of a single person. An absolute monarchy is under the unlimited power of its ruler, but a constitutional monarchy is one in which the monarch has placed some of his power in the hands of others. A monarchy may be a portion of an empire. England is a constitutional monarchy, a part of the British Empire, ruled by the Parliament, which has gradually acquired practically all of the king's power. There are no absolute monarchies of any importance. Monarchies are usually hereditary rather than elective.

WHAT IS A KINGDOM?

A kingdom is a monarchy ruled by a king.

WHAT IS A REPUBLIC?

A republic is a state in which the government rests in the hands of an assembly elected by the people. The United States is a republic, governed by Congress, which is made up of representatives whom the people choose.

WHO WAS THE FIRST WHITE MAN TO SAIL UP THE ST. LAWRENCE?

See Volume IV, page 43.

WHAT DAY DOES CANADA CELEBRATE AS ITS NATIONAL BIRTHDAY?

See Volume VIII, page 384.

HOW BIG IS CANADA?

See Volume VIII, page 384.

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WHERE DO EASTER LILIES GROW?

In Bermuda and Japan, which supply the lilies and also thousands of bulbs which are brought to blossom by American florists.

WHEN WERE FANS FIRST USED?

EARLY Egyptian paintings as well as ancient Indian and Chinese drawings show that the use of the fan dates back to primitive times. Fans were used in India and China to keep flies off the sacred offerings in the temple, and later as hand implements for cooling the air. One of our pictures of Oriental luxury is of princes and fine ladies lying or sitting in state while attendants fan them. These early fans were usually of plumes, the wings of birds having been the models. The folding fan is said to have been a Japanese invention, made in imitation of the wing of a bat. It was introduced into Europe in the Middle Ages, and the highly decorated fan became a much-prized luxury. Painters, of whom Watteau is the most familiar, did some of their most beautiful work on fans. The fan below with shepherds and shepherdesses dancing on the green is typical of this period.

WHERE DO THE FEATHERS GO?

Millions of pounds of feathers are used every year in the making of pillows and cushions, by milliners and by furniture makers. They come largely from the poultry farms of the country, and there are factories in several large cities where they are handled. First the feathers are taken to the upper floor and placed in a large machine which cleans them by means of live steam. Then they drop to the floor below and are blown into a long room by means of powerful blasts of air. The lightest feathers are carried the longest distance and the heaviest fall to the floor first. In that way the feathers are easily sorted. Finally they are dropped to another floor and packed.

Goose feathers are worth about sixty cents a pound and duck feathers a little less. Hen feathers are worth from five to ten cents, those that are pure white being valued highest.

GIRLS DANCING FOLK DANCES AT A COUNTRY COMMUNITY FESTIVAL

COMMUNITY REBUILDING

HOW CAN IT BE DONE?

[This valuable and interesting article is by E. L. Morgan, Extension Professor of Community Service, Amherst Agricultural College, one of the foremost workers in the country for the improvement of rural life conditions, to whom we are also indebted for the pictures and charts.]

IF we were to ask a business man what he hoped to be doing ten years hence, provided his enterprise continued to prosper, we should find at once that he had a well-laid plan for the careful maintenance as well as the ultimate enlargement of his business. Once our attention is directed to the matter, we find in every avenue of life men and women who are making a substantial success merely because they follow closely a carefully laid plan.

It is indeed strange that when we find people associating themselves together in communities, regardless of the size, they have, with very few exceptions, entirely forgotten the one thing which has made them individually successful and proceed to conduct the affairs of the community in the most haphazard, catch-as-catch-can manner. That is to say, the communities are few which have a sane, comprehensive, and workable long-term program which they are following as closely as the business man follows his well-laid plans.

One of the most significant movements of this decade is one which has as its task the promoting of the long-term-program idea in community life. While the movement which has had its birth in Massachusetts around her agricultural college has given the major emphasis to the development of the rural community, still there are a few cities in which the plan has been adopted with eminent success.

Our present consideration will be confined very largely to the problems of the small community whose chief industry is that of agriculture carried on in the adjacent countryside. In our mention of the community, let us think of it as an institution of which organizations and individuals are component parts, which can be efficiently conducted, and the size of which is usually determined by the "team haul" from the community center.

During the past twenty years some very great changes have been going on in the open country which have left their mark upon the life of communities. Chief of these has been the general failure on the part of agriculture to maintain itself on a paying basis under existing land, labor, capital, and market conditions. In every section of the country, excepting where specialized agriculture is being applied, we find farmers feeling that they are not receiving a reasonable wage for their work and that the open country does not afford the opportunities of a social and educational as well as of an economic nature which they want their children to enjoy. These two factors have brought about

a migration of, usually, the best young men and women of the community to the cities, where they at least imagine opportunities are better. Along with this untoward condition in farming as a business has come a general inability or unwillingness on the part of the people to tax themselves to maintain adequate, up-to-date schools. Thus we find the average rural school not ministering to the pressing needs of the pupils who attend it. In like manner the rural church has declined, partly because of a lack of adequate funds to maintain it, and partly because it did not supply, through its leadership, certain counteracting and initial measures which might have turned the tide of community depletion. The general highways upon which the church and school depend so largely for the transportation of those attending ceased to enjoy adequate maintenance.

TOP (LEFT): YOUNG FARMERS SHOWING THEIR PRODUCTS. TOP (RIGHT): DISCUSSING COMMUNITY PROBLEMS. BOTTOM (LEFT): LEARNING THE GOOD POINTS OF A DAIRY COW. BOTTOM (RIGHT): A MEMBER OF THE TOWN POTATO CLUB

Thus we find the rural community generally out of repair. Those who could have directed it efficiently have in most cases gone to the city. The royal, hospitable social life of two decades ago has passed out. All public matters involving the expenditure of funds are dealt with in the most temporary and inadequate manner. Transportation and the marketing of farm products become arduous during the winter months when prices are the highest, owing to the poorly kept roads. In the estimation of the people, agriculture and country life have fallen into disrepute. The various organizations found in such communities are usually self-centered, selfish, jealous, unwilling to recognize or affiliate themselves with another, each existing for itself alone, not recognizing the fact that as such it owes anything to the community as a whole. The mere fact that agriculture does not pay under existing methods reflects itself into every avenue of the life of the community. There is

no community purpose or program and nobody boosts the community. This, then, is the problem which is met in any rebuilding of small-town community life. (See Chart I, page 64.)

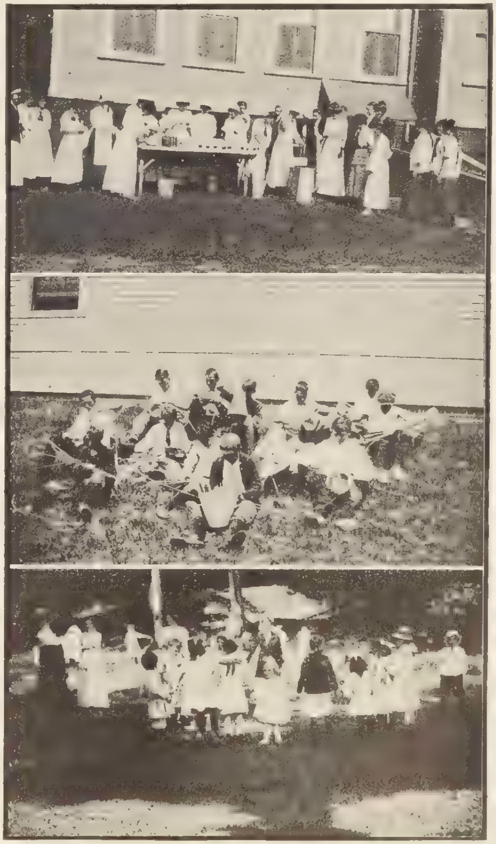
The fact that in a few such places the tide has been turned and the community redirected leads us to analyze the process used and to discover, if we may, certain principles which must be recognized as determining factors in any such endeavor. Our present interest, therefore, lies in the question: How can such a community redirect its efforts toward the making of itself the most desirable place to live and its industry a pleasant and profitable undertaking?

In one of the above-mentioned places one man conceived the idea of the community turning right-about-face and rebuilding what had for years been a declining town. By persistent effort he discovered, enlisted, developed, and trained four others who were capable of leadership. To these he gave his vision of the possibility of placing their town in the front rank. These five soon called a mass meeting at which the whole matter was gone over very thoroughly. There were, of course, those who said, "You can't do anything in this town." The meeting resulted in the appointment of six committees; namely, education, industries (including agriculture), civic affairs, church affairs, recreation and sanitation, and transportation and communication. These were appointed to do two things: to make a very thorough study of the town and to report a set of recommendations to a second mass meeting which was called a month after the first. These committees called in from the outside a large number of individuals as well as representatives of organizations, who gave them expert advice in their various lines.

To the second mass meeting each committee brought a few carefully selected recommendations for the community to consider. These comprised some items which could be accomplished in one year, while others would require a period of years to fulfill. These embraced tasks which might be accomplished by the various natural groups represented in the community. Such of these as were adopted became the community long-term program.

A community council comprising the committee chairmen, together with one representative from each organization in the town, was brought into life, not to serve as an end in itself, but to be the "clearing house" or the get-together method of the organized forces of the community.

As a result of this enterprise the community now has a virile, comprehensive, long-term pro-



TOP: A COMMUNITY TOMATO-CANNING CLUB. MIDDLE: FARM BOYS BEING TAUGHT HOW TO MAKE THINGS USED ON THE FARM. BOTTOM: FARM CHILDREN BEING TAUGHT TO PLAY

gram which has been worked out by the community as a whole and concerning which every individual has had opportunity to express himself. In the working out of this program each organization has assumed its real place in a coöperative community-progress enterprise. Between the various organizations there is now coöperation, cordiality, toleration, sympathy,

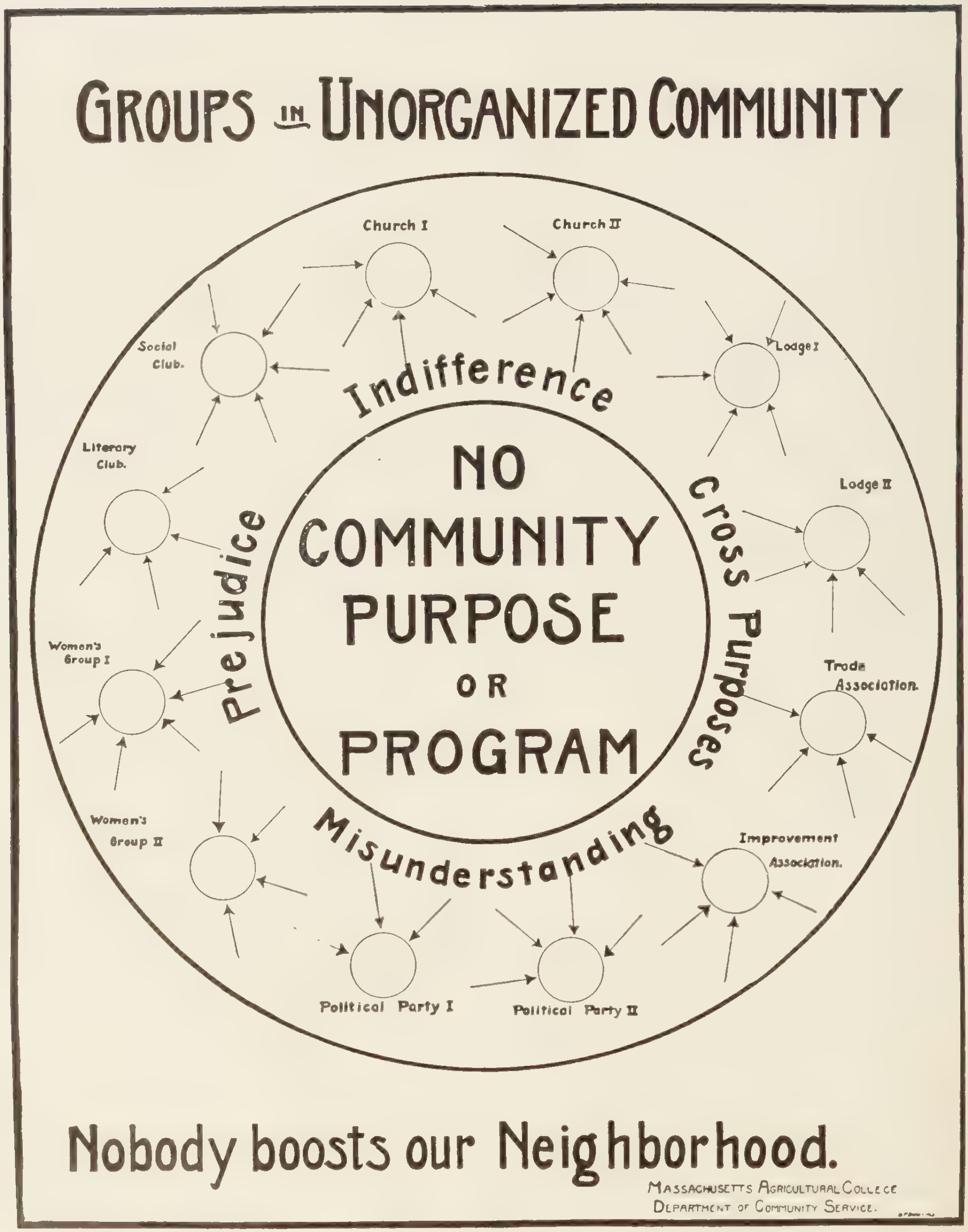


CHART I

Notice that in this community each of the twelve groups centers in itself and is separate from the other eleven.

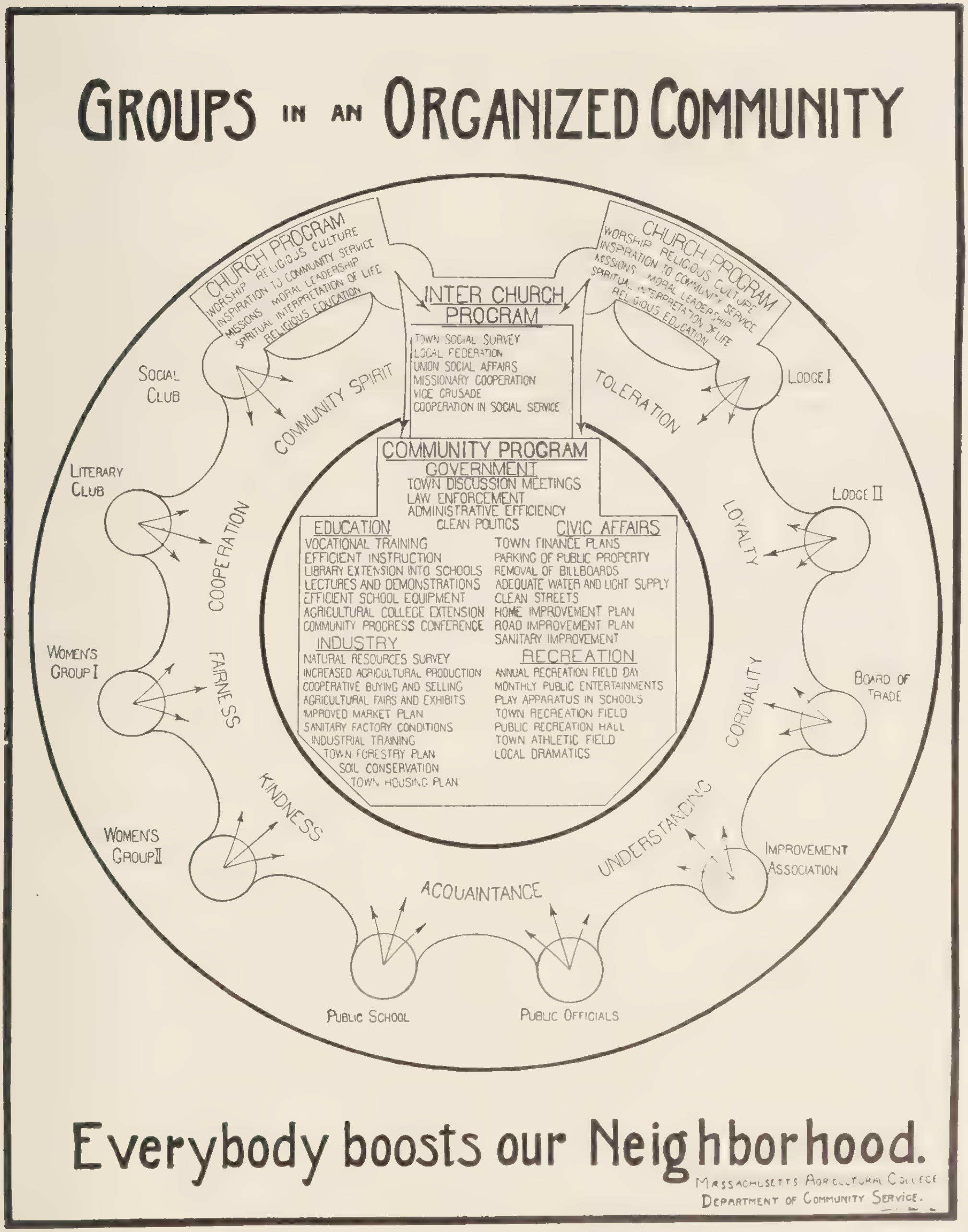


CHART II

Here the twelve groups center in the community and are united by the bond of interest in community betterment.

AT A COMMUNITY PICNIC

and understanding; everybody boosts the community because it now has a working plan which they call their "long-term program." (See Chart II, page 65.)

In the community-progress plan just mentioned, some principles were applied which must be thoroughly familiar to all if the community redirection is to be adequate and permanent. There are many well-meaning persons at work in social redirection to-day whose efforts may be compared with those of a mere mechanic who attempts to readjust an intricate and delicate piece of machinery. His efforts mark failure owing to the fact that it is a task for a skilled mechanical engineer. Nothing is needed so much in rural community redirection as fewer social mechanics and more skilled social engineers. Our teachers' training schools, theological seminaries, and agricultural colleges must be looked to for men and women of this type. In most cases these are not forthcoming because of inadequate courses of study.

In the case of the community referred to, the one man who was the mainspring of the enterprise deserves the title of Rural Social Engineer as well as that of Superintendent of Schools, for such was the grade of work done. By careful study he had come to see the real fundamental difference between city and country folk due to those factors of physical environment which influence both mind and body. The small community was seen as an identity or unit by itself and not a small-scale imitation of the city. This being true, the whole plan was rural in its nature, which went far to stimulate rural-mindedness on the part of the people generally. Continually in the process we find that our engineer remained in the background, knowing full well that the only forces which can adequately and permanently direct community life are the local forces developed and trained. These comprise the men and women who are a part of the permanent life of the community, as the school superintendent is not.

Through the medium of the mass meetings, all of the people not only knew of all the plans all the time, but really helped to formulate them as well. This gave a genuine popular form of social control. In most towns the affairs are directed by a self-appointed few, the public having little voice, for only those measures favored by the few prevail. The result is class control, which destroys popular initiative.

In the working out of the recommendations for the long-term program by the various committees, and later in the applying of it by the Community Council, the idea of the component

AN OUTDOOR CLASS

parts of the community was kept very definitely in mind. If it were possible to take a cross-section cut of the life of a community, we could find a number of distinct natural layers or groups, each one being held together by the fact that those who make up the group have matters of real importance in common. A very simple classification of the groups is according to age, occupation, sex, belief, organization affiliation, and social status. The applying of the long-term program not only means united community action on many matters, but also involves special and peculiar tasks for school children, boys and girls of the adolescent age, men and women from twenty to forty, and from forty to sixty. Those interested in agriculture have a definite plan, which is a part of the whole, for the development of the industry, not only in increasing production but in coöperative buying and selling as well. In like manner other groups will find tasks peculiar to their own needs and capabilities. Thus, the group instinct, which is one of the strongest in mankind, will be given full place, with a man for every task and a task for every group, and all for the whole. In this way natural local leadership will rise to its own place in its own way.

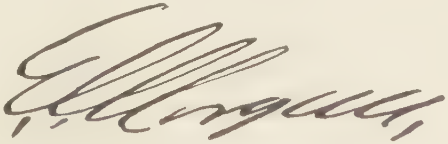
It is well for us to remember that there is no internal, national problem which does not go to untoward conditions in individual communities as its source. This is as true in the country-life problem as it is in problems of sanitation, housing, dependency, or crime. This being true, the solution of many of our present-day problems lies in the working out and applying by the community as a whole of a comprehensive long-term program maintained on a basis of small-town life and not an adaptation of city to country.

That rural community life may be properly directed, there must come a greater class consciousness on the part of country dwellers. I think of a community-progress program as a great load which has to be lifted. On every occasion there will be a number, all too large, of otherwise excellent people, who, by their lethargy, if not open opposition, say, "Just go ahead and lift us all, if you can." That is to say, community progress cannot come until the individual comes to see that he is a real, definite part of the warp and fiber of the life about him and

PRIZE CAULIFLOWER EXHIBITED AT A COMMUNITY FAIR

that he cannot honestly seek to be relieved of its responsibilities.

The greatest single need in this whole matter is one of leadership — that our colleges train those whom the community will call to its leadership, especially doctors, teachers, preachers, to become real social engineers for the open country. When this comes in larger terms than to-day, we shall see the repair of small-town life come in those forms which give value to the things in the open country; the community will move and breathe in joy and enthusiasm of the country. The celebrations will be of country matters and not of the city, they will rise so far as possible on the ground, and be essential to the life of people living in the open country. The country community will mark out its own path of progress. It will have life of its own of which it will boast, and the streams of waste will be stopped, the exodus from the country will be turned back, and the community will be rebuilt.



WHY IS SOME WATER HARD AND SOME SOFT?

PURE water is always soft. It is only when it has dissolved some foreign substance that it becomes hard. Water always contains a little carbonic acid gas in solution, which makes it capable of dissolving some kinds of rocks, especially limestone. In regions where there is a great deal of limestone the water will be very hard, as in Kentucky, where it has eaten out the Mammoth Cave.

WHY DOES HARD WATER LEAVE A CRUST IN A TEAKETTLE?

When water boils, the carbonic acid gas which has enabled it to dissolve limestone is driven off into the air. The limestone which is released forms a deposit on the bottom of the kettle.

WHY DID OLD-FASHIONED WATCHES RUN FAST IN COLD WEATHER AND SLOW IN WARM?

They ran fast in cold weather because the escapement wheel, the small wheel which spins back and forth and governs the speed of the watch, would contract from the low temperature and thus spin faster. In warm weather the escapement wheel would expand and spin more slowly. The modern escapement wheel has its rim in two or more sections, each section being fastened at one end only. Each section is also formed of two metals, the expansion and contraction of which tend to counterbalance each other.

WHY DO SOAP BUBBLES FLOAT IN THE AIR?

A soap bubble blown with the mouth in the usual way is filled with warm air, which is lighter than the cooler air of the room. It therefore rises. Soon the air in the bubble cools and the weight of the bubble causes it to descend.

WHY DO WAVES BREAK ON THE SEASHORE?

Water in motion will always dash against any resisting surface and fall back. On a long, sloping beach the friction at the base of a wave will retard it, so that while the top is moving along the bottom is held back. This makes the top of the wave curve in a crest which will finally fall over and break. In breaking, the crest lets in air particles which make bubbles of white foam.

WHY DO YOU FLOAT MORE EASILY IN SALT WATER THAN IN FRESH?

Because salt water is slightly heavier than fresh water; and as the body sinks only low enough to displace an amount of water weighing just what the body weighs, it will not sink so far in salt water.

WHEN A FAUCET IS LEFT RUNNING, WHY DOES THE FLOW OF WATER GRADUALLY DIMINISH?

Perhaps you have not observed that the flow does diminish; but it does, and the explanation is that the leather or rubber washer, against which the plunger of the faucet is pressed in order to shut off the water, is compressed when the water is turned off, and gradually expands when the pressure of the plunger is removed, thus making smaller the hole through which the water flows.

WHY DOES A POND FREEZE ONLY NEAR THE SURFACE?

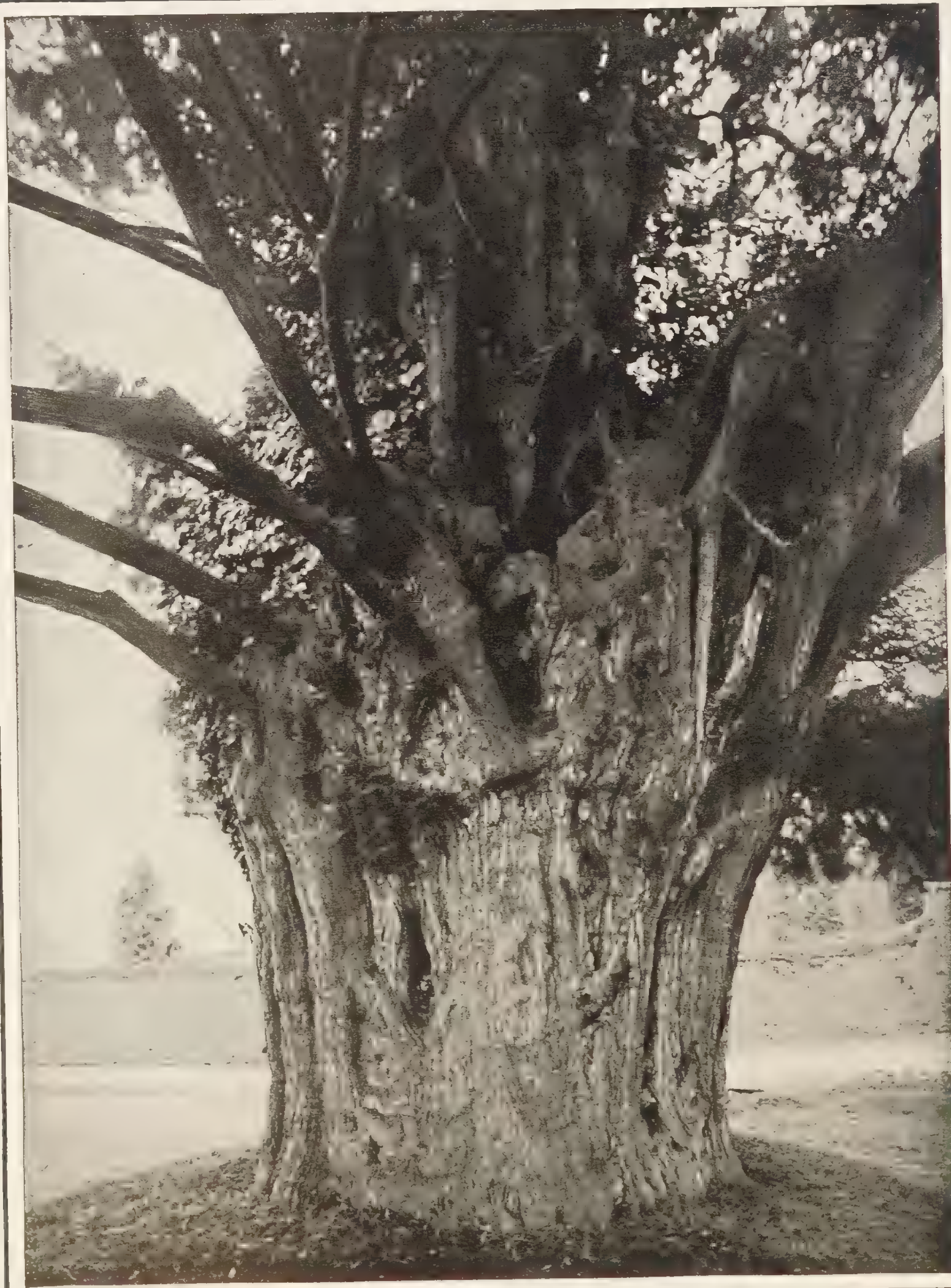
Water is heaviest at about seven degrees Fahrenheit above its freezing point. In the

ICE CUTTING

The ice is marked off into squares, an ice cutter is run through, the blocks are pushed on an endless chain and carried to the ice house.

slow circulation of the water in a pond, the heaviest layers gradually work to the bottom. The colder part on top freezes and the lower layers are so protected that they never have a chance to get any colder. This is extremely fortunate, for it takes a great amount of heat to melt ice. To melt a given quantity takes about forty-five times as much heat as to raise the same amount of water one degree Fahrenheit.

It has been calculated that if all the bodies of water in the temperate zone were to freeze solid, the heat of the entire summer would not be enough to melt them.



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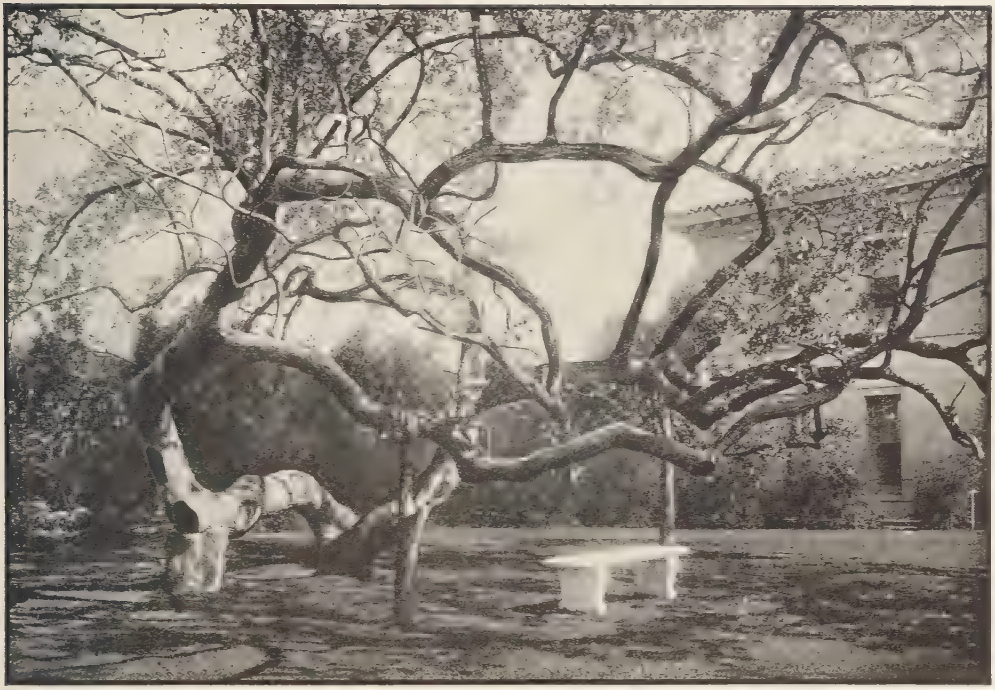
A YEW TREE A THOUSAND YEARS OLD



AN OLD TREE PATCHED AND PROPPED UP BY THE TREE SURGEON

WHAT IS TREE SURGERY?

ON the campus of St. John's College, Annapolis, Md., stands a tulip tree six centuries old. The tree is one hundred and fifty feet high and twelve feet in diameter. It must have attained great size by 1652, for in that year the first treaty with the Susquehannock tribe of Indians was signed under its branches. Locally it is spoken of as the "Liberty Tree."

Some years ago a large branch was broken off and, as the wound was not given proper attention, so much of the tree rotted away that the old giant seemed destined to be felled by the wind. Then a tree surgeon was engaged to save it if possible. This man first cut out the decayed wood, revealing an enormous cavity extending up through one of the branches to a point fifty feet above the ground, where there was a hole large enough to admit a laborer. The rotten tissue was carefully scraped away for the entire length of this great cavity. Then an antiseptic wash was applied, after which the interior of the tree was filled with reënforced concrete, the amount required being no less than fifty-five tons. This was a conspicuous example of tree surgery.

Trees were never so highly valued as at the present time. Men of wealth will gladly pay several hundred dollars in order to preserve a single specimen. Fruit has increased greatly in value, and often it pays to restore neglected orchards, even at considerable expense. A horde of insect pests seems to have entered into a conspiracy to kill the fine trees which line our streets, and drastic measures are required in order to hold them in check. It is easy to understand why tree surgery has come, within a few years, to be a profession of importance. Yet it is not a line of work which can be taken up in a casual way; both study and experience are demanded.

If cavities are being filled, it is important to get all decayed tissue out, and sometimes fire is used for this purpose. The filling material may include stones, bricks, and the like, but

TREE CAVITY WITH NAILS TO HOLD CEMENT

the cavity must be cemented over finally with such skill that not a drop of water can possibly find entrance. The cement must be applied in such fashion, too, that the bark will gradually grow over it. Sometimes the interior of a tree is driven full of nails, in order that the cement may be made to hold well. This plan is very likely to be followed if the cavity is wide but shallow.

The work of the tree surgeon is not confined to the filling of cavities. Much other work is required in the preservation and restoration of fruit and shade trees. Trimming and pruning are important items. In former days it was the custom of farmers to let their trees grow tall and to cut away the lower limbs, but trees so trimmed are very difficult to handle according to modern methods. An expert is able to remove the high heads from these old trees and to grow new heads much closer to the ground. Only fairly low trees can be sprayed effectively. Spraying is exceedingly important in these days, when the San José scale, the tent caterpillar, the coddling moth, and many other pests must be fought persistently. The tree surgeon is familiar with all the various spraying mixtures and is equipped with elaborate and expensive apparatus for applying them.

In New England of late years, armies of men have been at work and millions of dollars have been expended for the purpose of holding in check the brown-tailed and the gypsy moth, two imported pests which have done an almost incalculable amount of damage. At one time the brown-tailed moths invaded homes, crawled into the beds, and carpeted the floors. Many people were forced to close their houses and go away. Orchards and street trees were stripped as bare as though fire had run through them. Fences were hidden from sight by traveling hosts of caterpillars. It has even been declared that it was possible to hear the pests feeding. Many of the leading tree experts of the country have been engaged in a ceaseless struggle to keep these moths from spreading to other parts of the country.

To succeed as a tree surgeon one must be resourceful. The illustration on page 71 shows an old tree of which the owner of a large estate in the West was very fond, but which was literally falling to pieces. A tree surgeon

A CEMENT-FILLED TREE TRUNK

A SYMPHONY IN GRAY AND GREEN

who was called in patched it with cement in a dozen or more places, and then built concrete supports, which were modeled and colored to represent lengths of natural wood. One support carries much of the weight of the tree and has the appearance of a huge stump. This is tree surgery of an unusual sort, but it illustrates the possibilities of the art.

As a profession, tree surgery offers excellent inducements to young men seeking a career which will give them an active outdoor life. The demand is growing, but it is hardly worth while taking up this sort of work except in a thoroughgoing way. In some sections the whole theory of tree preservation has been discredited because of the bungling work of inexperienced men. A tree which has been growing for a century may be ruined in a day by a novice who has not been properly trained for his work.

HOW CAN YOU TELL THE AGE OF A TREE?

You can tell roughly the age of a tree by the number of rings shown in a cross section of its trunk. Look at the next tree stump you come upon and see these rings. As all trees have alternate periods of growth and rest each year, a single growth-ring is added annually. Since the main branches are often nearly as old as the trunk, the age can be told approximately by the number of rings shown in a cross section of a main branch. In trees like the pine, the age can also be found by counting the tiers of branches along the trunk, for one of these grows out every year.

WHY DOES A TREE GROW STRAIGHT UP, EVEN ON A HILLSIDE?

Because the direction of its growth does not depend upon the slope of the surface of the ground, but on the force of gravity, which always works in a vertical direction.

HOW DOES A TALL TREE CARRY WATER UP TO ITS TOP?

This is a very difficult question and botanists are not agreed as to just how the water is carried up to such a height. It cannot be by ordinary pumping action, because a pump will raise water only twenty-eight feet. The force of "capillarity," which makes oil rise in a lamp wick, cannot pull water up so high. The living cells in the wood and in the leaves are probably able to form in some way a series of little pumps and thus to draw the water up very high.

HOW CAN THE ROOTS OF A TREE SPLIT A ROCK?

The growth of a root in diameter is often very slow, but the force which it exerts in this growth is tremendous. A little root which is able to enter the crevice of a rock may thus in time completely split it.

WHY ARE THE UPPER SIDES OF LEAVES DARKER THAN THE UNDER?

A leaf is composed of layers of cells filled with green coloring matter called "chlorophyll." The cells on the upper side of the leaf are more closely packed together than those on the under side, which have many little mouths between them through which the leaves may take in nourishment.

WHAT ARE LEAVES FOR?

Leaves are the manufacturing department of the plant. The raw materials are taken in from the air and from the soil and made over here, with the help of the sunlight, into plant food. This is then distributed by the sap all over the plant.

WHAT MAKES LEAVES FALL IN THE AUTUMN?

Leaves do not fall through the action of frost alone. During August and September a thin layer of corky cells forms at the point where the leaf stem joins the twig. As the season advances this layer separates into two circular layers, leaving only the central bundle of veins to hold the leaf. Then, with the first strong wind, or a frost, this bundle is torn apart and the leaf falls.

HOW MANY EVERGREEN TREES DO YOU KNOW?

See Volume III, page 393.

COPY DESK IN THE NEWS ROOM OF A METROPOLITAN DAILY

BEHIND THE SCENES

IN A NEWSPAPER OFFICE

FOR two cents you may buy a newspaper which has cost thousands of dollars to produce. Every quarter of the globe has been combed to bring you the information which is scanned in a half-hour's hasty reading. Men have risked their lives, perhaps, to obtain the news which holds your eye for one brief moment. Cables and wireless, steamships and trains, presidents and premiers, capitalists and convicts, have all had a part in the making of the newspaper which lies neatly folded by your breakfast plate.

There is little about the paper, as it rests there, fresh and clean, to suggest the romance of its birth; no hint of the great trees felled by the acre and ground into pulp to form the unprinted sheets; nor of the marvelous press which has printed and folded and counted it; nor yet of the trucks, electric vans, and newsboys who have made possible its delivery at your door long before you were out of bed. Sometimes it is difficult to decide which is the more amazing, the news or the mechanical side of newspaper making.

HOW IS THE NEWS GATHERED?

First, let us ask the question, "What is news?" In general it is the story of current events at home and abroad in which the general

public is interested. Mere scandal and gossip about private individuals is not real news. Yet news may be specialized and interest only small groups. To the investor it is the stock market items. To the importer it means the shipping reports.

One paper's motto, "The News while It is News," indicates an essential quality in all newspaper work. Timeliness is of the utmost importance. Readers expect their news "smoking hot," with the result that a newspaper office is a scene of never ending activity, strain, stress, and toil. Within fifteen minutes from the time an important dispatch comes into the office, the papers may be selling on the street.

Yet no one should picture newspaper men as always rushing about in a fever of excitement, or of newspaper rooms as filled forever with uproar and commotion. Editors and reporters learn to deal calmly and dispassionately with even the most tragic events. There are hours when the reporters' room seems to be the storm center of the universe, and one wonders how men can sit quietly at their desks, clicking out their typed reports, seldom pausing, almost never changing a word, amid the turmoil and din; but for the most part the work of a newspaper office goes on like that of a well-ordered mercantile establishment.

All news is handled through departments. The city editor, with his staff of reporters, looks after local happenings. The telegraph editor handles the matter which comes by wire. There is a financial editor, with assistants, a dramatic editor, an exchange editor, a sporting editor, a household editor, and perhaps others. Above them is the man from whom they receive their instructions, the managing editor, who is the executive of the news departments. He reports in turn to the editor in chief, who is responsible only to the owners of the paper. In some instances the editor in chief is the owner and is known simply as the editor. If there are morning and evening editions, there will be two city editors with their reporters, and possibly two complete editorial staffs as well. There will be a Sunday editor, too, if there is a Sunday edition, and most of the larger papers have an art editor who handles the illustrations and who may be assisted by a corps of artists and photographers, for pictures are almost as important in metropolitan journalism as written reports.

HOW DOES A REPORTER WORK?

It is natural that local news should be considered of first importance. Most people are more eager to read about a thousand-dollar fire in the next block than about a conflagration five hundred miles away. The city editor, then, is the most important of the subeditors. He sits at a desk with an assignment book at his elbow, in which are noted all the important local events scheduled for the near future. He looks over his list day by day and beside the announcement of each event writes the name of the reporter whom he desires to have "cover" it, to use the word usually substituted for the verb to "report." The assignments may cover a wide range, for while one man is attending a meeting of workingmen's wives to protest against the high price of food, another may be interviewing the Secretary of State, who has come to the city for a public dinner.

Other reporters are held for occurrences which could not be foretold — bank failures, riot calls, and other kinds of news which may "break" at any moment. In the larger cities are news agencies which have men posted at all centers of routine news — the police and fire headquarters, the morgue, the courthouse, and the hospitals. These men keep in close touch with their office by telephone, and their reports are sent in multiple to all the newspapers subscribing to the service. In this way routine news is covered at a minimum of expense; yet all the papers have special men also assigned regularly to these news centers, and all important "stories" are written by them. Reporters are always alert for "scoops" or "beats," two terms for news reports which one paper publishes exclusively, the others not having learned of them. A "scoop" may be of tremendous advertising value to a paper if of unusual interest or importance; but it counts for less now than formerly, because the other papers are able, with modern facilities, to copy the account and get it out on the street in slightly different form in a very few minutes.

If time presses, a reporter may telephone his story to his office. Possibly he may give

only the outline, in which event a colleague will sit down at a typewriter and soon turn out a detailed report. It is a simple matter to tell a reporter to get a story, but the getting of it may present endless difficulties. It may be necessary to interview a score of persons, no two of whom give the details alike. The desires of certain informants to have what is published colored to their advantage must be discounted. Important facts must be wormed from people whose interest it is to conceal them. Prominent men must be summoned from their beds at midnight or later. The most dangerous quarters of the city must be visited, and desperate men interviewed in prison cells. It may be necessary to ride on a freight train, or even to charter a tug to meet an incoming liner. These are the duties which a seasoned reporter is called upon to sandwich in between such routine assignments as weddings and street accidents.

The reporter's written story is known as "copy." Let us see what happens to it before it reaches the man who puts it into type. First it goes to the copy readers, who, in many offices, sit about a large round table. They "cut" the copy, revise it, and alter it as they see fit. There are certain rigid rules about newspaper writing, and if they are found not to have been adhered to, the story goes back to the reporter to rewrite.

It is an ironclad rule that the gist of a story shall be contained in the first paragraph, in order that the reader may obtain the salient facts, although he may stop there. It is another rule that only one side of the paper shall be written on and that there shall be wide spaces between the lines. Sentences are not expected to run from one page to another, and signs, which vary, are used to indicate whether more of a story is to be handed in or if it is complete.

Almost every office has a long series of special rules which the copy readers must know by heart. These rules may even go so far as to specify that the names of certain people shall not appear in the paper, and they frequently include many "don'ts" in connection with the use of slang or overworked phrases.

It is an important part of the copy reader's work to write the heads which are placed at the top of all articles. Each paper has its particular style of head, and all heads are "built" in a manner designed to suit the type of paper. A "scare" head such as would appear over a street fight in one paper would be used in another only in the event of a terrible calamity. It is not an easy matter to write a good head, for it must tell practically all of the story, and yet only a certain number of letters can be used. One needs a wide vocabulary in order to find suitable words of just the right length and to have them in his mind virtually by the time he has finished the last page of the copy in his hand. Professors of English have tried to write heads and have made pitiful failures of the attempt.

HOW IS COPY PUT INTO TYPE?

The city editor and often the managing editor may look a story over after the copy editor has finished with it, and may order it condensed or elaborated, according to its importance and the exigencies of space. We will suppose, however, that it is passed along rapidly in its journey to the man who sets the type.

A pneumatic tube carries it to the composing room, where it goes to a copy cutter, a man who slices it into short sections, each of which is called a "take." These takes are scattered among several linotype operators, for all typesetting is now done by machine, except in small offices. Takes are numbered according to the rule of the office, in such manner that there will be no difficulty in assembling them again, and a corresponding mark is used by the linotype operators. This system of using takes has been adopted because of the fact that a piece of copy may be set up much more quickly than if it were given to a single operator.

The typed sections are next put in a "galley" and a proof taken or "pulled" on a small press. The proof readers make any needed corrections, and in a few minutes the pages have been "made up," which means that the different typed articles have been placed in their respective positions. The positions of the article are determined by a make-up editor, or by the managing editor.

The solid page of type is next covered with a sheet of papier-mâché and is subjected to pressure and heat. Presently the soft paper is found to have received the exact impress of

Courtesy of The Independent, New York

HEADLINES OF NEW YORK'S FORTY-FOUR DAILY NEWSPAPERS ON THE DAY WHICH BROUGHT NEWS OF THE GREAT WAR IN 1914

the type. From this "matrix" a solid cylindrical plate is molded, and this plate goes on the press, which soon begins to print papers, perhaps at the rate of one hundred thousand an hour.

WHAT ARE THE TELEGRAPH EDITOR'S DUTIES?

Let us go back a little now and learn what is going on meanwhile in the room of the telegraph editor. To this department comes the news of all the world, save that within a radius of a few miles. Some of it is supplied by special correspondents at Washington, and in other important cities at home and abroad, but the greater part comes over the wires of one of the great news-gathering associations, which have reporters in every corner of the globe. You may read exactly the same reports in hundreds of different papers, but these papers obtain in this way a mass and variety of material that would be quite out of the question if they were forced to get all their telegraph news direct.

HOW ARE NEWSPAPER PICTURES MADE?

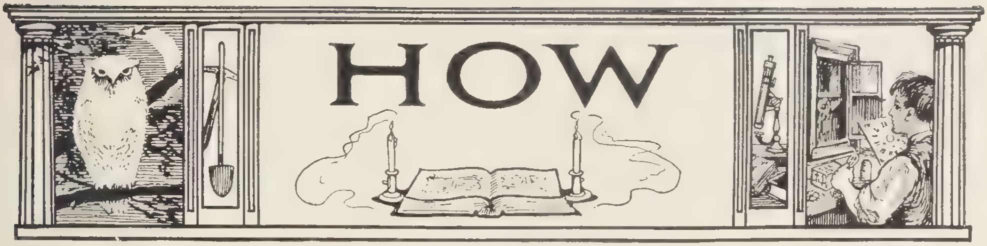
News photographers have come to be almost as important as news reporters. When any news of special import "breaks," a camera man is dispatched in haste. He carries a kind of camera with which he can make snapshots under almost all conditions, and the plates which he turns in a little later are developed so fast and cuts made from them so quickly that the pictures and the reporter's text reach the make-up man at almost the same moment.

OTHER IMPORTANT DEPARTMENTS

Quite apart from the quarters of the newsmen are those of two other department heads, the advertising manager and the circulation manager. Both are very important individuals and have numerous assistants. Without a great volume of advertising the paper would not have revenue enough to pay its bills. It is because of the advertising receipts that you are able to buy your paper for a cent. If it were not for the advertising, you might have to pay five or even ten cents for your copy, and you would get a much smaller paper, too.

It is impossible to get people to advertise in a paper unless it can show a large circulation. Of course the foundation of a large circulation is to be found in copious and accurate news reports, so that, after all, the success of the paper depends largely upon the efforts of its editors and reporters; yet the circulation manager, if he is competent, finds many ways of introducing his paper to new readers and of otherwise extending its sales.

What has been written applies to large city dailies, many of which have enormous circulations, running almost to a million in a few instances. The task of getting this vast output of printed matter into the hands of the news companies and the street boys, loaded on to the trains and speeding to suburban sections in wagons and automobiles, also falls on the shoulders of the circulation manager; and broad shoulders they must be, for in the rush of work that comes with extra editions and the never ending rivalry with competing papers, annoyances, mistakes, and blunders are sure to pile one on another, and only a cool head and good generalship can bring order out of the seeming chaos.



HOW DID PLANTS GET THEIR LATIN NAMES?

MANY years ago, before people began to study plants carefully and when almost the only botanists were the men who gathered medicinal herbs, each plant which was common or was important because of its useful or harmful properties was given a name. These names were often very different in different localities, just as are the "common" names of plants to-day. This often led to much confusion, because a plant which in one place was a "buttercup" or a "primrose" might be a "crowfoot" or a "cowslip" in another. Not until the sixteenth century were lists of plants compiled and an attempt made to write their descriptions carefully. Even then the men who wrote the accounts were interested only in the healing powers of the plants. They made little books called "Herbals" giving, so far as was possible, the various names under which each plant had been known to the ancients and also those by which it was called in the language of the time.

HOW ARE PLANTS NAMED NOW?

In the eighteenth century the great naturalist Linnæus established what is called the "binomial" system of names. He divided up the vegetable kingdom into "families," such as the rose family, the mint family, and the lily family, putting together those plants which resembled each other in a general way. Each family he separated into "genera," or smaller groups, such as apple, rose, strawberry, sage, mint, and balm. Under every genus were included all the various kinds of plants in that particular group. Thus in the rose genus were put the Scotch rose, the dog-rose, the cinnamon rose, the eglantine, and others. Each genus was given a definite Latin or Greek name and every species under it had an additional name as well. Thus the Scotch rose was *Rosa spinosissima;* the dog-rose, *Rosa canina;* the cinnamon rose, *Rosa cinnamomea;* the eglantine, *Rosa rubiginosa*, and so on. These names of the species were intended to be descriptive of the plant or to tell the locality in which it grew. The two names, under this binomial system, thus placed every plant definitely in its particular species and genus and also indicated at least one of its important characteristics. This general plan of the classification and naming of plants was so much simpler than the old way that it was soon taken up by all botanists and zoölogists and used in describing all the new species which were discovered as time went on. To-day these scientific men, whatever language they speak, can all understand what plants and animals their friends are talking about, because no matter how many common names any species has, or no matter if it has none at all, it is definitely labeled with two Latin ones which are recognized all over the world.

HOW CAN A TREE HAVE A HOLLOW AND DECAYING HEART AND YET BE ALIVE AND HEALTHY?

The heart of the tree is always dead and has nothing to do with carrying up water from the roots. All this is done by the sapwood, a thin layer of wood just under the bark. The heartwood may therefore decay without killing the tree, although the trunk is much weakened and is apt to break easily.

HOW DO PLANTS BREATHE?

Plants have no lungs, as do animals, but the air which they need passes in and out through thousands of tiny pores or "stomata," which are found almost entirely on the under side of the leaves. Air also gets into the twigs through little loose rough places in the bark called "lenticels."

WHO WAS THE FIRST ENGLISH SOVEREIGN TO USE A FORK?

QUEEN ELIZABETH (1533–1603), who much displeased many people by the newfangled notion. Indeed, one preacher delivered a sermon against the use of forks, declaring it an insult to God, when He had given us fingers with which to eat our meat. To eat with knife or fingers was then good form.

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JULIA WARD HOWE

One of the most noted American women of the nineteenth century; author of "The Battle Hymn of the Republic"; writer and lecturer for antislavery, woman's suffrage, prison reform, and international arbitration.

WHO FIRST PLAYED DOMINOES?

Dominoes doubtless originated from dice, since two dice faces placed side by side make a domino. The Chinese claim their invention in the twelfth century by Hung Ming for the amusement of his soldiers. China perfected the game and gave it to Europe.

WHO DISCOVERED CUBA?

Christopher Columbus, October 28, 1492. He named it Juana, after Don Juan, son of Ferdinand and Isabella of Spain, and it has been renamed at least four times since; but it has retained its native Indian name, Cuba.

WHEN WAS PORTO RICO DISCOVERED?

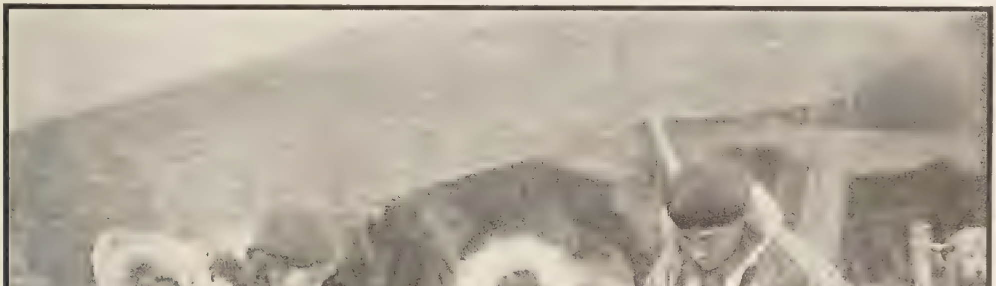
In November, 1493, by Columbus on his second voyage. Ponce de León established a colony on the island in 1509. The original Indians, called Borinquens, were all killed off.

WHO IS SAID TO HAVE VISITED AMERICA IN THE SIXTH CENTURY?

St. Brendan, a monk, born in 485 in Kerry county, Ireland, burning with a passion to discover strange lands and save souls, sailed with sixty Irish monks on a voyage of discovery. On their return they reported an adventurous voyage of forty days, at the end of which they had found a fertile land, thickly wooded and full of birds and flowers, strange animals, and strange human beings. The story of St. Brendan's voyage was told all over Europe and recorded in manuscripts in every language. Columbus, while he was endeavoring to fit out his first expedition, wrote, "The Land of St. Brendan is the Land of the Blessed toward the West, which no one can reach except by the power of God."

WHERE DID TAMMANY HALL GET ITS NAME?

A DELAWARE chief of the seventeenth and eighteenth centuries, named Tamanend and called by the white men "Tammany," who was famous for his wisdom in council and his friendliness to settlers, was jokingly called by the Revolutionary soldiers the "patron saint" of the republic. In 1789, when the society now known as "Tammany Hall" was founded in New York City, two weeks after the national government was established, it adopted an Indian organization with thirteen tribes, corresponding to the thirteen original states of the Union, Indian symbols, mottoes, and sachems, and took the name of St. Tammany for its own. The "wigwam" in which the society met was known as "Tammany Hall," the name now given to the organization, which is almost as old as the republic.

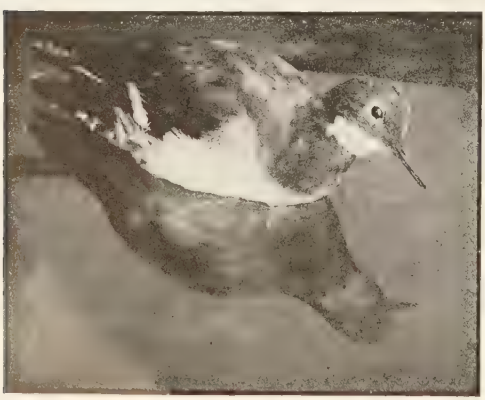


WHERE DID THE ESKIMOS GET THEIR NAME?

The name "Eskimo" means "eater of raw flesh," and was given the Eskimos by the Indians. They call themselves "Innuit," meaning "the people." You can read about them in Volume I, page 327.

WHAT CAUSES A MIRAGE?

A MIRAGE is the reflection of distant objects in the sky. Near the horizon one will sometimes see what looks like a city or an island or trees, but is really a reflection of some object that is beyond the range of one's vision. These reflections are caused by a sudden change of density in the atmosphere. This condition may occur anywhere at any time, but is exceedingly rare outside of the most heated regions of the desert or over stretches of ocean. The reflections are upside down and are modified in color by the blue haze of the air. For this reason reflections of sand hills and barren plains may look like cities and great lakes of water, deceiving travelers whose vision is already strained by the intense glare of the sun. The curving of a ray of light as it is refracted through layers of air of different densities will also distort the image. A mirage, therefore, is not an optical illusion, but a real reflection.



HOW DOES WATER REFLECT?

A smooth surface of water has the same property as a mirror, of turning back the rays of light which fall upon it, making an image which looks exactly like the object. To find out more about how light is reflected, read Volume I, pages 97–100.

WHAT ARE ACCIDENTAL COLORS?

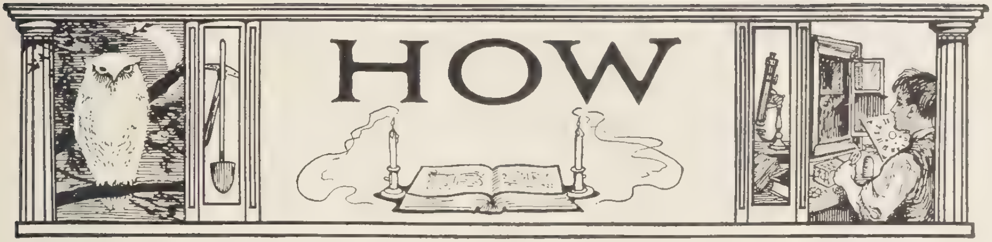
Those which depend on sight, not those which an object normally possesses. For example, after you have looked at the sun all objects appear dark. Come out of a dark room and all objects have at first a yellow tinge. The accidental or complementary color of red is bluish green; of orange, dark blue; of violet, yellow; of black, white. One of the leading Parisian dress designers determines which shades he will put together in his gowns by whirling colored disks and seeing which colors are complementary and which seem to the eye to shade off on the edges of the rapidly moving disks.

WHAT MAKES COLOR?

See Volume I, page 100.

WHAT IS THE ULTRAMICROSCOPE?

The ultramicroscope is an instrument which makes visible to the eye infinitesimal particles that are far out of reach of even the most powerful microscopes. When a beam of sunlight illuminates a darkened room, we see floating in the air myriads of fine dust particles which under ordinary circumstances are quite invisible. This is the principle of the ultramicroscope. The reflected rays of the sun, or of a bright arc light, are directed across the field or space wherein the object which is to be seen is situated; the object catches the light and shines out as a bright spot on a dark ground. Thus it is really a compound microscope combined with powerful reflectors — a microscope, as its name indicates, which sees "beyond" the power of the ordinary instrument. The ultramicroscope has enabled bacteriologists to discover and identify organisms some seventy-five times smaller than can be seen with an ordinary instrument.



HOW CAN YOU TELL THE SPEED OF A RAILWAY TRAIN?

EVERY time the car wheel passes over a rail joint it makes a click. Count the number of clicks in twenty seconds, and you will get the number of miles the train is going an hour.

HOW CAN A SOUND BREAK A PANE OF GLASS?

We all know that a sudden jar will break a flat piece of glass. Sound waves caused by an explosion of dynamite or some similar violent disturbance will sometimes break against a window miles away with sufficient force to shatter the glass. This means that the vibrations of the air have carried the effect of the commotion faster and farther than it has been conveyed by the solid particles of the ground.

HOW FAST DOES SOUND TRAVEL?

We usually think of sound as traveling through air, but as a matter of fact it travels more readily through many solids. It goes through air at a rate of eleven hundred feet a second; through wood ten times as fast; through iron fifteen times as fast; and through water four times as fast.

The next time you go in bathing in a quiet pond, place your ear just under the water. Then let a friend knock two stones together under water a few hundred feet away. You will be surprised to find how loud and clear the noises sound. But if your friend taps the stones together out of the water, when your ear is no longer submerged, the blows sound very much fainter.

The fact that sound waves travel so quickly and produce such distinct sounds under water led to the invention of the submarine signaling apparatus (described in Volume II, page 185), now used by so many vessels and lightships, to indicate their positions in dense fogs.

HOW CAN YOU MAKE A STRING TELEPHONE?

The string telephone depends, as do all telephones, on the power of sound to travel fast through solid bodies. Take two empty tin cans or gas-mantle boxes and a hundred feet or so of ordinary string. Punch a small hole in the center of the bottom of each can. Pass an end of the string through the hole and knot it securely. Then stretch the string taut and you have an efficient little telephone which will work very well between two houses that are not too far apart.

HOW MANY FOREIGN BIRDS HAVE WE?

The best known and perhaps the least popular of our imported birds is the English sparrow. Many other birds have been brought to this country from time to time, but none have flourished like the common sparrow. The English starling and the ring-necked pheasant have become fairly numerous in many parts of the country, but few other foreign birds have thrived here. Efforts have been made to introduce the Hungarian partridge, the skylark, the linnet, the lark, the English robin, and the little migratory quail, but in almost every case the birds have not thriven in their adopted country.

DOES WIRELESS TELEGRAPHY AFFECT BIRDS?

It is believed by some students that birds are much affected by the waves of wireless telegraphy. It has been noticed that migratory birds, carrier pigeons, sea gulls, and other birds accustomed to long flights over regular routes forsake the paths between wireless stations. Carrier pigeons sometimes seem to lose their way from this cause.

ARE THE POLES FIXED POINTS?

Considering its tremendous size and the course through which it travels, the earth moves with wonderful regularity. There is, however, as has been recently discovered, an irregular swinging on its axis which has been calculated from year to year and is shown on an exaggerated scale in this diagram from "The Sphere."

WHY WAS THE THISTLE CHOSEN FOR THE NATIONAL EMBLEM OF SCOTLAND?

THE story is told that during a Danish invasion of Scotland, when a party of Danes tried to surprise a Scottish encampment at midnight, one of them stepped upon a thistle and the pain caused him to cry out. The Scots, awakened by the sound, defeated the invaders, and the lowly thistle assumed a high place in their affections.

WHY IS THE WORD "AMEN" PRONOUNCED AT THE END OF A PRAYER?

In Hebrew "Amen" means "Yes" or "Truly." It was a Jewish custom for the congregation to repeat the word at the end of the benediction. The early Christians borrowed the custom, the congregation uttering the word in unison when the presbyter finished his prayer. According to its use in the English church, the word means "So be it," or "So it is."

WHY IS AN ENGLISH SOLDIER KNOWN AS "TOMMY ATKINS"?

The fictitious name of Thomas Atkins was originally used by the English government to show to privates enlisting just how they were to sign their names to documents and army forms. The illustration grew familiar and afterward the popular term "Tommy Atkins" came to apply to the common soldier of the English army.

WHY ARE THE FASTEST MOTOR BOATS FLAT-BOTTOMED?

It has been found that, when a boat is made with a flat bottom sloping gently to the stern, it tends to rise out of the water the faster it goes until it nearly skims along the surface. The farther out of the water the boat is, the less resistance it meets in pushing the water aside, and consequently the greater proportion of the engine power is utilized in giving the boat forward motion.

WHY DOES A PITCHER OF ICE WATER "SWEAT" IN A WARM ROOM?

See Volume I, page 76, under "How Air Gives Out Water."

WHY DO MANY FLOWERS CLOSE OR DROOP ON RAINY DAYS?

To keep their pollen from being spoiled by wetting. Pollen must be dry and dusty to fly readily and to stick to things easily.

WHY ARE BURDOCK BURS COVERED WITH HOOKS?

So that the fruit will be able to cling to men or to animals and thus carry the seed for long distances, spreading the plant widely.

WHY DO THE LOWER BRANCHES IN A PINE GROVE ALWAYS DIE AND DROP OFF?

Because the upper branches are thick and shut out the light. Light is absolutely necessary for a green leaf if it is to keep alive.

WHY DO FARMERS PLANT CLOVER ON A FIELD AND THEN PLOW IT UNDER?

On the clover roots are colonies of tiny bacteria which are able to take nitrogen directly from the air and to convert it into valuable plant food. Ordinary plants cannot take their nitrogen from the air, but must get it in the form of salts from the soil.

AMERICAN EDUCATION FROM THREE VIEWPOINTS

THE TRUE EDUCATION FOR AMERICAN CITIZENSHIP

(By Cardinal James Gibbons)

THE education of youth is the engrossing topic of our times. The vital question of the day is, How shall we shelter the lambs? Shall they be poisoned by the unhealthy pastures which are so temptingly placed before them, or shall their tender souls be nourished under the guidance of those who are their divinely constituted shepherds?

WHAT IS EDUCATION?

I am persuaded that the popular errors now existing in reference to education spring from an incorrect notion of that term. *To educate* means *to bring out*, to develop the intellectual, moral, and religious faculties of the soul. An education, therefore, that improves the mind and the memory, to the neglect of moral and religious training, is at best but an imperfect system. According to Webster's definition, to educate is "to instill into the mind principles of art, science, morals, religion, and behavior." "To educate," he says, "in the arts is important; in religion, indispensable."

It is, indeed, eminently useful that the intellect of our youth should be developed, and that they should be made familiar with those branches of knowledge which they are afterwards likely to pursue. They can then go forth into the world gifted with a well-furnished mind and armed with a lever by which they may elevate themselves in the social scale and become valuable members of society. It is also most desirable that they should be made acquainted in the course of their studies with the history of our country, with the origin and principles of its government, and with the eminent men who have served it by their statesmanship and defended it by their valor. This knowledge will instruct them in their civic duties and rights, and contribute to make them enlightened citizens and devoted patriots.

But it is not enough for children to have a secular training; they must also receive a religious education. Indeed, religious knowledge is as far above human science as the soul is above the body, as heaven is above earth, as eternity is above time. The little child who is familiar with the Christian catechism is really more enlightened on truths that should come home to every rational mind than the most profound philosophers of pagan antiquity, or even than many of the so-called philosophers of our own times. He has mastered the great problem of life. He knows his origin, his sublime destiny, and the means of attaining it — a knowledge that no human science can impart without the light of Revelation.

God has given us a *heart* to be formed to virtue, as well as a *head* to be enlightened. By secular education we improve the mind; by religious training we direct the heart.

It is not sufficient, therefore, to know how to read and write, to understand the rudiments of grammar and arithmetic. It does not suffice to know that two and two make four; we must practically learn also the great distance between time and eternity. The knowledge of bookkeeping is not sufficient, unless we are taught also how to balance our accounts daily between our conscience and our God. It will profit us little to understand all about the diurnal and annual motions of the earth, unless we add to this science some heavenly astronomy. We should know and feel that our future home is to be beyond the stars in heaven, and that, if we lead a virtuous life here, we shall "shine as stars for all eternity" (Dan. xii. 3).

We wish our children to receive an education that will make them not only learned but pious men. We want them to be not only polished members of society but also conscientious Christians. We desire for them a training that will form their heart as well as expand their mind. We wish them to be not only men of the world but, above all, men of God.

A knowledge of history is most useful and important for the student. He should be acquainted with the lives of those illustrious heroes who founded empires, of those men of genius who enlightened the world by their wis-

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THREE AMERICAN CARDINALS

From left to right: Cardinal Farley, Cardinal Gibbons, and Cardinal O'Connell.

dom and learning and embellished it by their works of art.

But is it not more important to learn something of the King of kings, who created all these kingdoms, and by whom kings reign? Is it not more important to study that Uncreated Wisdom before whom all earthly wisdom is folly, and to admire the works of the Divine Artist who paints the lily and gilds the clouds?

Our youth cherish the hope of becoming one day citizens of heaven as well as of this land. And as they cannot be good citizens of this country without studying and observing its laws, neither can they become citizens of heaven unless they know and practice the laws of God. Now, it is only by a good religious education that we learn to know and to fulfill our duties toward our Creator.

The religious and secular education of our children cannot be divorced from each other without inflicting a fatal wound upon the soul. The usual consequence of such a separation is to paralyze the moral faculties and to foment a spirit of indifference in matters of faith. Education is to the soul what food is to the body. The milk, with which the infant is nourished at its mother's breast, not only feeds its head, but permeates at the same time its heart and the other organs of the body. In like manner the intellectual and moral growth of our children should go hand in hand; otherwise their education is shallow and fragmentary, and often proves a curse instead of a blessing.

Piety is not to be put on like a holiday dress to be worn on state occasions, but it is to be exhibited in our conduct at all times. Our youth must put in practice every day the Commandments of God as well as the rules of grammar and arithmetic. How can they familiarize themselves with these sacred duties if they are not daily inculcated?

Guizot, an eminent Protestant writer of France, expresses himself so clearly and forcibly on this point that I cannot forbear quoting his words. "In order," he says, "to make popular education truly good and socially useful, it must be fundamentally religious. It is necessary that national education should be given and received in the midst of a religious atmosphere, and that religious impressions and religious observances should penetrate into all its parts. Religion is not a study or an exercise, to be restricted to a certain place or a certain hour; it is a faith and a law, which ought to be felt everywhere, and which, after this manner alone, can exercise all its beneficial influence upon our mind and our life."

In this country the citizen happily enjoys the largest liberty. But the wider the liberty, the more efficient should be the safeguards to prevent it from being abused and degenerating into license. The ship that is destined to sail on a rough sea and before strong winds should be well ballasted. To keep the social planet within its proper orbit, the centripetal force of religion should counterbalance the centrifugal motion of free thought. The only effectual way to preserve the blessings of civil freedom within legitimate bounds is to inculcate in the mind of youth while at school the virtues of truth, justice, honesty, temperance, self-denial, and those other fundamental duties comprised in the Christian code of morals.

The catechetical instructions given once a week in the Sunday school, though productive of very beneficial results, are insufficient to supply the religious wants of our children. They should, as far as possible, breathe every day a healthy religious atmosphere in the school, an atmosphere tending to invigorate and nourish faith, piety, and sound morality.

THE MOTHER'S ESSENTIAL PART

I am not unmindful of the blessed influence of a home education, and especially of a mother's tutelage. As she is her child's first instructor, her lessons are the most deep and lasting. The intimate knowledge she has acquired of her child's character by constant intercourse, the tender love subsisting between them, and the unbounded confidence placed in her by her pupil, impart to her instructions a force and conviction which no other teacher can hope to win. The education of a child must begin at its mother's knee. The mind of a child, like softened wax, receives with ease the first impressions, which are always the deepest and the most enduring. A child is susceptible of instruction much earlier in life than parents generally imagine. Mothers should watch with a jealous eye the first unfolding of the infant

mind, and pour into it the seed of heavenly knowledge.

For various reasons mothers should be the first instructors of their children:

1. As Nature ordains that mothers should be the first to feed their offspring with their own substance, so God ordains that mothers be the first to impart to their little ones the "rational milk" whereby they "may grow unto salvation" (I Peter ii. 2).

2. Those children are generally more healthy and robust who are nurtured by their own mothers, than those who are handed over to be nursed by strangers. In like manner they who are instructed by their own mothers in the principles of Christian piety are usually more robust in faith than those who are first guided by other teachers.

3. The more confidence a child has in his preceptor, the more he will advance in learning. Now, in whom does a child confide more implicitly than in his mother? In all dangers he will fly to her, as to an ark of safety, and will place the utmost reliance in what she says. Mothers should not lose the golden opportunity of instructing their children in faith and morals, while their hearts are open to receive their every word.

But how many mothers have not the time to devote to the education of their children! How many mothers have not the capacity! How many, alas, have not the inclination! And granted even that the mother has done her duty, the child's training does not end with the mother, but it will be supplemented by a curriculum in other schools. And of what avail is a mother's toil, if the seeds of faith that she has planted attain a sickly growth in the cheerless atmosphere of a schoolroom from which the sun of religion is rigidly excluded?

THE TRAINING OF TRUE MEN

Let us not forget that we are training citizens, and that our education has this throughout as one of its highest aims. "God give us men, true, Christian men," must ever be the prayer of one who loves his country and her political institutions, and this merit I may honestly claim. My aim has ever been to make those over whom I exerted any influence not only more upright Christians but also more loyal citizens; for the most faithful Christian makes the best citizen. I consider the Republic of the United States one of the most precious heirlooms ever bestowed on mankind down the ages, and that it is the duty and should be the delight of every citizen to strengthen and perpetuate our government by the observance of its laws and by the integrity of his private life. "Righteousness," says the Book of Proverbs, "exalteth a nation, but sin is a reproach to the people."

THE SECRET OF OUR NATION'S STRENGTH

If our government is destined to be enduring it must rest on the eternal principles of justice, truth, and righteousness, and these principles must have for their sanction the recognition of a Supreme Being who created all things by His power, who governs them by His wisdom, and whose superintending Providence watches over the affairs of nations and of men. Our government has from its dawn been guided by Christian ideals. Here Church and State move on parallel lines and mutually assist one another. The State holds over all the ægis of its protection without interfering in the sacred and God-given rights of conscience. Our country has liberty without license, and authority without despotism. Our nation is strong, and her strength lies, under the over-ruling guidance of Providence, in the majesty and supremacy of the law, in the loyalty of her citizens, and in the affection of the people for her free institutions. What is the secret of our stability and order? It results from wise laws based on Christian principles, and which are the echo of God's eternal law. How all-important, then, in a country like ours, that we shall educate the children in these essential elements which will fit them to appreciate, cherish, protect, and perpetuate the free institutions that are our glory and strength.

J. Card. Gibbons

THE COLLEGE AS A FITTING SCHOOL FOR LIFE

(By Chancellor Elmer Ellsworth Brown, LL.D.)

THE criticism is often made that the college training unfits for the actual work of life. We hear much in these days concerning industrial and commercial efficiency. The question is asked why a college, which turns out men, should not concern itself with the principles of efficiency as much as a factory, which turns out soap or shoes or breakfast cereals. The answer is perfectly obvious. The college is different just because it turns out men instead of manufactured articles. Men are different from the shoes they wear — incomparably more important and valuable. The efficiency of our colleges must accordingly be different from factory efficiency and incomparably more important. Furthermore, in colleges we find the common demand raised to the second degree, for their efficiency is to be judged by their power to increase the efficiency of their graduates.

With the great majority of men, the most important increase of efficiency that can be made is to raise their standards and ideals. Technical skill is important, indeed indispensable; but the purpose and motive and conception of the man who has it are even more significant. The requirement that men in our professional and technical schools shall begin to master the mere processes of their chosen occupation is to be insistently emphasized, because through such mastery men acquire the habit of making connection between their abstract knowledge and the work they have to do. It accustoms them to success, and success breeds more success. But success may be on too low a plane, so narrow in scope and poor in relationships that it will soon wear itself out and be thrown aside. The great thing, if we are to make men competent in any calling, is to put them in possession of the better ideals and standards of that calling. The best thing that a student gets from his course of studies is a better understanding of what it is that he really wants to know and do. Efficiency is increased by many per cent when a student is brought to a better apprehension of the things that are worth striving for, and set to run with mighty purpose toward the prize of some high calling. College has not only to teach the sciences, but to see that the spirit of science shall strike in, and make men everlastingly dissatisfied with inaccurate, standardless, conscienceless work.

Scientific efficiency and the ideal of public service belong together. We shall not keep our science keyed up to its best in the life of a great university unless we keep the university awake to its public responsibilities. Its students and graduates should make their contribution to the betterment of public administration and the furtherance of the higher aims of government. The schools of commerce and government have a direct work to do in fitting men for administrative service in city, state, and nation. These and other schools show how far we are removed to-day from the college ideal of a century ago, which undertook to render a single service to the public in a single way; and equally far removed from the earlier university ideal, which with its school of arts and its schools of the three so-called learned professions had only four organs of its activity. Now there is no limit to the number of its divisions, except the limit of resources and immediate opportunities; and the more advanced of our modern universities claim the right to contribute to the betterment of human life in all of its larger aspects. They touch its commonest occupations with the wand of science and the arts, and those common occupations become professions, dignified with aspirations and ideals, vivified with scientific processes, glorified with the sense of obligation to humanity.

Our modern life finds its all-absorbing problem in the endeavor to realize a true democracy. Academic institutions are not now concerned simply with the making of superior men. They must send out men who are both superior and companionable. The leaders whom they train must be able to lead, not condescendingly, but through wide coöperation. It is hard to achieve this combination of democracy with the leadership of the best, but in that union lie the heart and focus of our modern life. And our colleges and universities must succeed in this or yield their place in the van of the world to some worthier type of institution.

A constant concern of the university must be

the combination of liberal with vocational instruction, and of both of these with the cultivation of the peculiar endowment of individual students. A liberal education fits a man to view the interests of mankind as if they were his own, while his vocational training fits him to do his own proper work as if it were a work for all. But the conservation of all valuable personal initiative and individuality is not to be overlooked. When originality of thought and character is joined to sound culture and professional competence, it becomes one of the most precious things in the world, a thing to be cherished in the interest of both democracy and leadership.

Surely no one can justly charge a college education with unfitting a student for the "school of hard knocks" that is to follow, provided the student has learned in college how to focus his powers on things that are worth while, and has learned to live not unto himself. These are two great things for which the college and university stand. Concentration is one of the large elements in our modern ideas of efficiency. But the highest efficiency lies in the concentration of personal power, intelligence, conscience; a concentration that discriminates. A man is to be judged not merely by the things he does, but also by the things he leaves undone. But harder to learn than this lesson of focusing one's powers on things most worth while, is the further lesson that a man's success lies chiefly in what he does for others. College men and women should be better home makers, better friends and associates, better partners in the teamwork of the world, because of the education they have received. The emphasis laid upon this altruistic principle is making it less and less true that college withdraws the student for some of the best years of his life from participation in or sympathy with the work of the world. The modern courses given in our schools of commerce, with their divisions of government and public administration and journalism, and the provision made for vocational training of all kinds in connection with the graduate schools, prove that the universities are alive to the demands and needs of our modern life.

It is true that once in a while we hear the ideal of the American college set forth in terms that suggest dilettantism, but, generally speaking, Americans take a much more serious view of college life. The common disparagement of the college graduate is not justified. It is certain, however, that our colleges cannot safely set a lower standard of serious, exacting, and intensely real exertion than that which is set by the school of hard knocks. The college is different, more attractive, more inspiring, more friendly; but it must not be more indulgent and easy-going, it must not have in it less of conviction and strenuousness. It must not be allowed to mean four years of gentlemanly leisure, but four years in which students and faculty are to work together at their level best to see how far forward they can carry the students toward the attainment of their highest ambition in life. By wise guidance every one of these college years can be made to count for five years, ten years, it may be, of advancement toward genuine success.

This higher training of the college and university should be brought within the reach of all who are ambitious to advance in knowledge. With this end in view, New York University and other urban institutions conduct college courses in the heart of the city, with late afternoon and evening classes, so that young men and women employed by day can have the advantages of collegiate studies and receive collegiate degrees the same as other students. In addition to the demand for evening instruction in the vocational courses, there are many who are eager to take the purely cultural studies, while still others would combine the cultural and the vocational. This is but one of the many ways in which our universities are linking themselves to the general advancement of the community life. Nothing could be farther from the truth than to suppose that our highest institutions of learning are not in hearty sympathy with the life and work of the world, and earnestly seeking to graduate students who shall be able to make substantial contributions to all movements for human progress.

Elmer Ellsworth Brown

SHOULD UNIVERSITIES TEACH BUSINESS?

(*By President Lemuel Herbert Murlin, D.D., LL.D.*)

IN the earliest outlines of plans for Boston University, President Warren included a College of Commerce and Navigation. It was not established then, because he was far ahead of his time. There were at that time only three "learned professions"; now education has so progressed that the number of learned professions is no longer catalogued. Trained men are needed everywhere, and are nowhere more needed than in the field of business management. Gradually, through the last twenty years, the world has been coming to President Warren's vision, and such schools have been organized in most European countries, in Great Britain, and in the United States.

Investigation shows that the supremacy of Germany in commercial education is due to the fact that commercial schools of high-school grade are found in almost every city and town in the German Empire numbering over 650; while at Leipzig, Berlin, and other universities similar schools have been established, with two years required for a diploma. In France, Austria, and Belgium there are schools which provide thorough systems of commercial education, with special preparation for young men intending to become merchants or manufacturers. The degree of Bachelor of Commercial Science is conferred, and also that of Master of Commercial Science for advanced work. Training for consular service is also given. Three English universities have regular courses in commercial subjects, conferring degrees. The fact is recognized that the training of business men is as important for the community as the training of lawyers and doctors, and these new schools promise to become worldwide in location and influence.

IN THE UNITED STATES

In our own country there are schools of commerce, finance, and business administration at New York University, Northwestern University, Harvard, Columbia, Cornell, Boston University, Washington University at St. Louis, and at the State Universities of Pennsylvania, California, Illinois, Minnesota, Ohio, and Wisconsin. Dartmouth College and the University of Pittsburgh also have distinct schools, while about a hundred other colleges and universities offer some courses in phases of business administration, showing the tendency to give business training some place in a college and university curriculum.

The School of Commerce, Accounts, and Finance was established at New York University in 1900, offering courses of college grade in the afternoon and evening, and conferring the degree of Bachelor of Commercial Science for three years' work. It is gratifying to note that the report of the Committee on Education of the American Association of Public Accountants gives our American schools credit for securing the most practical results, both in studying business at first hand and in working out in a constructive way new principles of business action.

WHY HAVE SUCH A DEPARTMENT IN A COLLEGE OR UNIVERSITY?

Because our economic life has been growing more and more complex and demands better minds to grapple with its problems. Because there are hundreds of young men who would take a higher education if emphasis were laid upon subjects which had to do with their future careers. Because the universities ought to have a more influential place in the business life of the country.

More than three fourths of the persons engaged in the gainful occupations in the United States are occupied in agriculture, fisheries, mining, manufacture, mechanics, engineering, trade, and transportation. The problems involved in the most efficient management, adjustment, and development of this great mass of the active population of our country present the most important tasks we have to deal with. It is startling to think how little influence the universities have had in training the great men in banking, railroads, insurance, trade and industry, diplomacy, journalism, and politics. These persons do not come to the universities for college work because that work will not train them directly for their future careers.

But why should not the colleges offer them courses as useful to their purposes as are offered to the professional teacher or the lawyer, doctor, and clergyman?

If there is a present tendency for the most powerful elements of the community among the growing boys and young men to go into business, it stands to reason that if these persons can be induced to come to the university, the gain will be mutual. The university will have an infusion of fresh blood and draw to itself new students without losing its present constituency; it will fit for all instead of for a few professions; and it will bring force to the cultural elements, and culture to the forceful elements.

If the community's good is furthered by four years of training for the dentist, surely the responsible positions of merchant and banker may be raised to a higher standard of efficiency with as much benefit to all. Higher business education will uplift the trade or business. The law school has elevated the practice of law. Schools of commerce will do as much for trade. A business career is a profession as noble in its way as that of lawyer or engineer, and men and women must be trained for it.

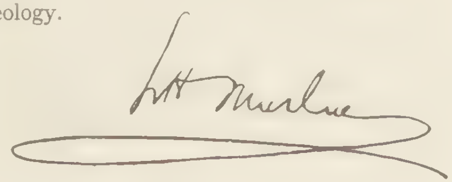
A business department fully recognizes the value of rigid education, and would not lower the standards, but endeavors to adapt the courses so that they will become useful and preparatory to one's life work. It enables the student to equip himself so that he cannot be crowded from the field of success for lack of business experience. It supplies a happy medium between the scholar of the so-called "liberal arts" and the practical, shrewd, so-called "self-made" business man.

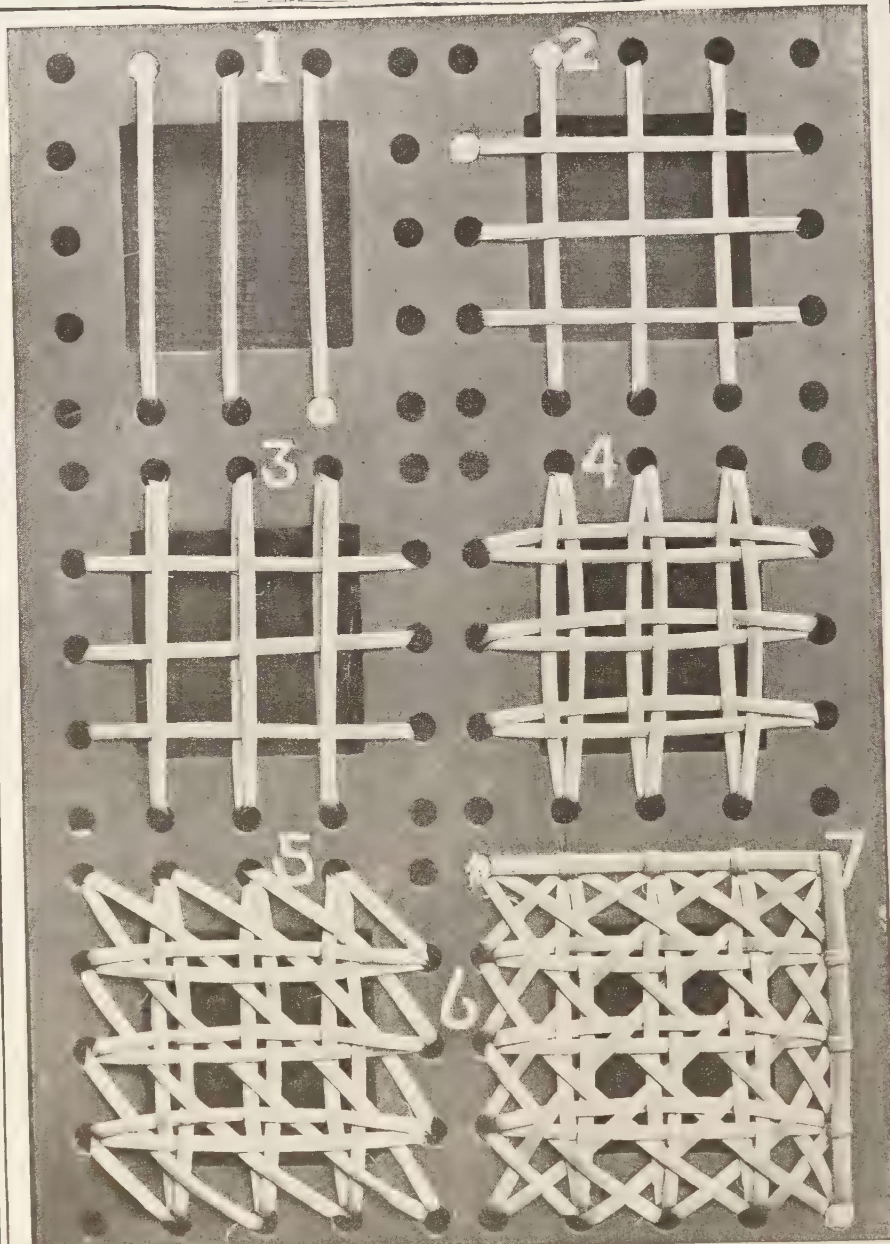
THE STUDIES TAUGHT

The same general line of study is followed in these commercial schools in both Europe and America. The subjects include bookkeeping, understanding of balance sheets, accounting, business calculations; science, which reveals the stream of wealth and its sources, connections, and accumulations; languages, commercial law, insurance, or things every business man ought to know about; geography, enabling one to judge about the natural resources of a country and its desirability as a place of investment of capital; physics and chemistry, each the key to the understanding of industries, mills, factories, patents, and so forth.

This shows the breadth of the work. The task is not easy. Young men are encouraged to take as long and complete a course as possible. The four years' college course will not seem long if it includes the studies, like those named above, which tend to give a practical education for business. Shorter courses, where necessary, will help greatly, especially if taken as graduate courses. It is the business of the university, however, to afford to students that kind of education which they desire, within legitimate bounds, and to place educational facilities within reach of the largest possible number. The supreme function of the university in a democracy is to equip men for the highest type of citizenship; and this involves efficiency and success in whatever line of effort they engage.

Back of all work worth while, however, is always the man. He is greater and far more important than trade, transportation, manufacturing, or business; and these are transformed into the likeness of the man behind them; he makes them, but they, in turn, make him. Educational processes best serve all other ends and aims if first they serve their supreme object; namely, to develop character, to train young life into a forceful, efficient, upright manhood and womanhood. If education fails in this respect, it fails altogether. If the educational endeavor produces efficient and worthy lives, it is a glowing success, whatever the educational instrumentalities employed. In accomplishing these ideal ends in education the spirit of the educational institution and the personality of the members of its faculties are the vital factors; having these, it is not too much to say that the subjects of study in a college of business administration have as distinctly educative value as have those in law, engineering, medicine, or theology.





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THE SEVEN STEPS IN MAKING A CANE SEAT

1. Vertical. 2. Horizontal, over 1. 3. Vertical, over 1 and 2. 4. Horizontal woven over 3 and under 1 back of 2. 5. Diagonal under the horizontal and over the vertical pairs. 6. Diagonal, over the horizontal and under the vertical pairs. 7. Binding over the holes in the frame.

WHAT IS THE AVERAGE LENGTH OF HUMAN LIFE?

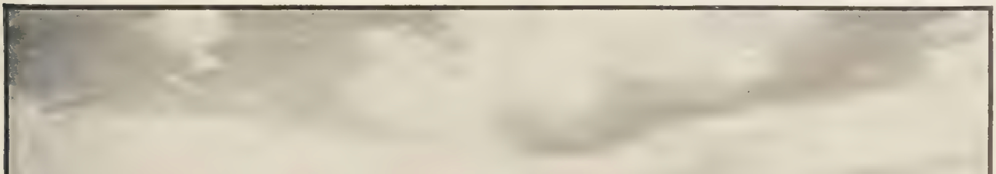
THIRTY-THREE years. One quarter of the people die before the age of six; one half before sixteen; only about one person out of every one hundred lives to the age of sixty-five years.

WHAT NAMES ARE AS SHORT AS IT IS POSSIBLE TO MAKE THEM?

The village O in France, the river Y in Amsterdam, the city U in China, and the town of A in Sweden. A member of the nobility who lives in the village of O in France has for his title "Marquis d'O."

WHAT STATUE WAS PULLED DOWN TO MAKE BULLETS FOR AMERICAN SOLDIERS?

When the Revolutionary War broke out, there was an equestrian statue of King George III on the bowling green at the foot of Broadway in New York. After the reading of the Declaration of Independence, this statue was pulled down by the citizens of New York and converted into forty-eight thousand leaden bullets for use against the British.



WHAT IS THE OLDEST CONTINUOUSLY OCCUPIED TOWN IN THE UNITED STATES?

Acoma, New Mexico, an Indian pueblo, which was visited by Alvarado, of Coronado's expedition, in 1540.

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HOW ARE STATUES MADE?

Statues, whether of bronze or marble, are copies of an original model made by the sculptor. A bronze statue, like those above, which are the product of a New York bronze foundry, is cast in a mold taken from the clay original, while a marble one, like that on the opposite page, is carved and chipped from the block of stone by skilled workmen who follow the clay model with the utmost exactness. A machine invented recently facilitates this work. The sculptor usually adds the finishing touches on both the bronze and marble work.

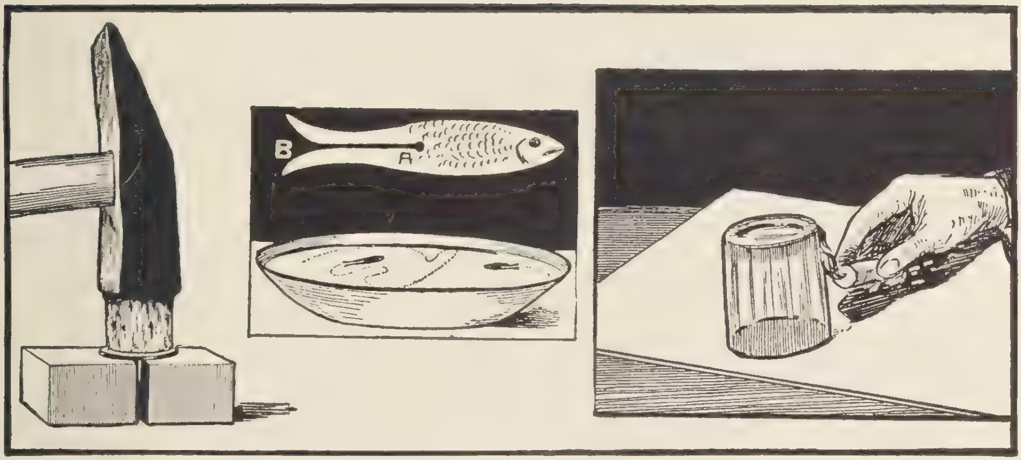
Marble, because of its clear whiteness, gives the best opportunity for delicate contrasts of light and shade, and is capable, therefore, of a higher finish than bronze, which must be left rather rough in order to emphasize the shadows in the naturally dark metal.

A ROMAN HORSEMAN

For other examples of sculpture, see Volume V, pages 272–306.

KING ARTHUR

A fine example of finished workmanship. Note the detail in the chain armor and breastplate.



THE PIERCED COIN, THE ARTIFICIAL SWIMMER, AND THE SLIDING TUMBLER

FUN WITH SCIENCE

PIERCING A COIN WITH A NEEDLE

TO pierce a penny or a nickel with a needle, if the needle is a fine one, would seem to be an impossible task. It is really a very simple matter, and the only apparatus needed is a cork, a needle, and a hammer.

If possible, select a needle just about the same length as the cork. Stick the needle through the cork in such a way that the point just protrudes; if the other end of the needle projects above the cork, cut it off with a pair of pincers or heavy shears. After placing the coin and cork on two small blocks of wood, as shown in the diagram, hit the cork a vigorous blow with the hammer. The cork prevents the needle from bending, and the blow of the hammer therefore forces the steel point right through the softer metal.

THE ARTIFICIAL SWIMMER

Cut a piece of ordinary note paper into the shape and size of a minnow, or other small fish, following the model shown in the accompanying illustration. There must be a hole at the center *A*, connecting with the narrow canal *A–B*. Place the paper fish in a tub or good-sized basin of water, so that only the lower part of the paper becomes wet. If you then pour a large drop of oil very gently into the opening *A*, the fish will at once begin to travel over the surface of the water.

When oil comes into contact with water, it always tends to spread out into as thin a film as possible. Its only way of escape in the case of our fish is through the narrow canal *A–B*, and its progress through this tiny passage forces the light paper forward, to the surprise of all spectators.

This is one of a number of tricks that depend on the refusal of oil and water to mix.

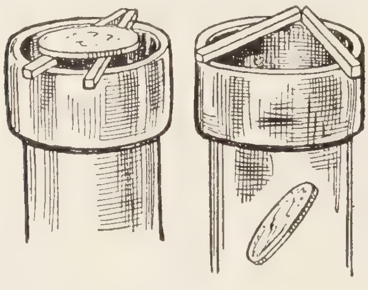
THE SLIDING TUMBLER

Place a glass face down on a marble slab, one edge of which is slightly higher than the other. Before placing the tumbler on the marble surface, soak its rim in water so that the entire rim is quite wet. The glass will remain at rest. But if you place a lighted candle close to the tumbler, as shown in the picture, and keep it there for a moment or two, you will see the glass begin to move and slide along, as if it were propelled by some mysterious force.

What causes this phenomenon? The heat of the candle expands the air in the tumbler and raises it slightly, but the film of water round the rim prevents the escape of the air, and the glass, no longer resting on the marble, but on a thin layer of water, follows the inclination of the slab and slips along its entire length.

THE MATCH PUZZLE

All you need for this interesting puzzle is an ordinary match, a quart bottle, and a coin. Bend in two a good-sized wooden match, partly breaking it, so that the two parts are



held together by a few fibers of wood. Now place the match in an acute angle across the mouth of the empty bottle, with the coin on top, as shown in the first illustration.

Ask a friend how he would make the coin fall into the bottle without either touching or breathing on the bent match or the coin. It is more than likely that he will be unable to solve the problem, which is really very simple. All you have to do is to dip your finger in a glass of water and, holding it above the angle of the bent match, allow a few drops to fall upon the broken part. Swollen by the moisture, the fibers of the wood will gradually straighten out, and little by little you will see the angle of the match getting larger and larger, until, no longer supporting the coin, the latter drops inside the bottle.

THE POWER OF THE BREATH

Most of us have inflated a paper bag just for the fun of listening to the loud report when we hit the bag afterward with our fist. It is probable, however, that few of us have stopped to think just how much power our lungs are capable of. The same paper bag will give us a good idea of this force.

Take a long, rather narrow bag of stout paper. Lay it flat on the edge of a table, its mouth toward you. Now place one or two heavy books upon the bag and begin to blow. You will be surprised to find how much weight your breath will lift. After a little practice it will be quite easy to raise one or two unabridged dictionaries, one above the other, by blowing underneath them.

RAISING THE COIN

The solution of the following trick depends upon one of the most elementary laws of physics, and yet few persons will be apt to solve it offhand. Place a fifty-cent piece in the middle of a table, directly below a gas fixture or hanging lamp. Tie a piece of yarn securely to a second half dollar, laying it upon the first silver piece. Then fasten one end of the yarn to the overhead fixture, so that it hangs straight and taut and does not raise the second half dollar in the air. Now ask anyone in the company to remove the half dollar on the table without touching the coin which rests upon it or the hanging string. The coin must not be pushed away with a ruler or knife blade, nor can the table be pushed aside.

The solution is simple. It is only necessary to spray the hanging yarn with a little water from an atomizer or fountain-pen filler. As soon as the threads of the yarn become wet, the string will contract and raise the upper fifty-cent piece, when it will be easy to remove the lower coin. The action of the yarn shows the marked tendency of all fibers to contract when moistened.

FUN WITH SOUND WAVES

With the help of such everyday articles as a sheet, umbrellas, and plates, it is possible to perform some interesting experiments which illustrate the behavior of sound waves. Sound waves pass easily through ordinary cloth, so long as it is dry. If the cloth is wet, however, the waves are reflected, as the tiny open spaces in the fabric become filled with water and prevent the passage of the waves. It is easy to test this action of cloth under different conditions by taking an ordinary cotton sheet and soaking half of it in water. The sheet should then be hung from a line so that the division between the wet and dry parts is about on a level with the ear. Now hold a

watch behind the sheet and move it slowly up and down. The ticking will be heard very plainly when the watch is behind the dry portion of the sheet, but will not be heard at all when the wet part of the cloth hangs between the watch and the listener's ear. If the watch is now suspended between the sheet and the ear, the effect is reversed. The ticking will be heard only faintly when the watch is held near the dry part of the sheet, for many of the sound waves will pass through the cloth. But when the watch is held near the wet cloth, the sound waves are all reflected and the ticking will sound loud and clear.

The reflection of sound waves by wet cloth may be shown in amusing fashion by the aid of two umbrellas. These should first be thoroughly soaked in water and then placed, wide open, about twenty feet apart. To make sure that the handles of the umbrellas are on the same level, they should be connected by a piece of twine. Each umbrella may then be adjusted over the back of a chair, and when both handles are exactly parallel with the taut string, the latter may be cut. The two persons who are performing the experiment take places beside each open umbrella, so that their ears are on a line halfway from the middle to the outer edge of the umbrella and a little distance from the wet cloth. If one person now converses in a low whisper, his remarks will be heard distinctly by the party at the other end of this unique sound reflector, while no sound at all can be heard by anyone who listens halfway between the two umbrellas. The voice, too, will not seem to come from the side of the listener which is turned toward the speaker, but from just the opposite direction. The sound waves are reflected by the wet surface of the first umbrella and travel to the concave surface of the second, where they are reflected a second time to a focus at or near the ear of the listener. Thus the sound is naturally louder on the side which is farthest away from the speaker.

A variation of this experiment can be performed with two concave plates. One of the plates — a large, deep soup plate is best for the purpose — is placed upon a table, and a watch is hung about four inches above its center. The second soup plate should be held at an angle of forty-five degrees beside one's ear. The sound waves caused by the ticking of the watch will then be collected in the concave interior of the second plate and reflected to the ear of the listener. The sound will be unusually loud and clear, and will appear to come from an entirely different direction from the spot where the watch is actually located.

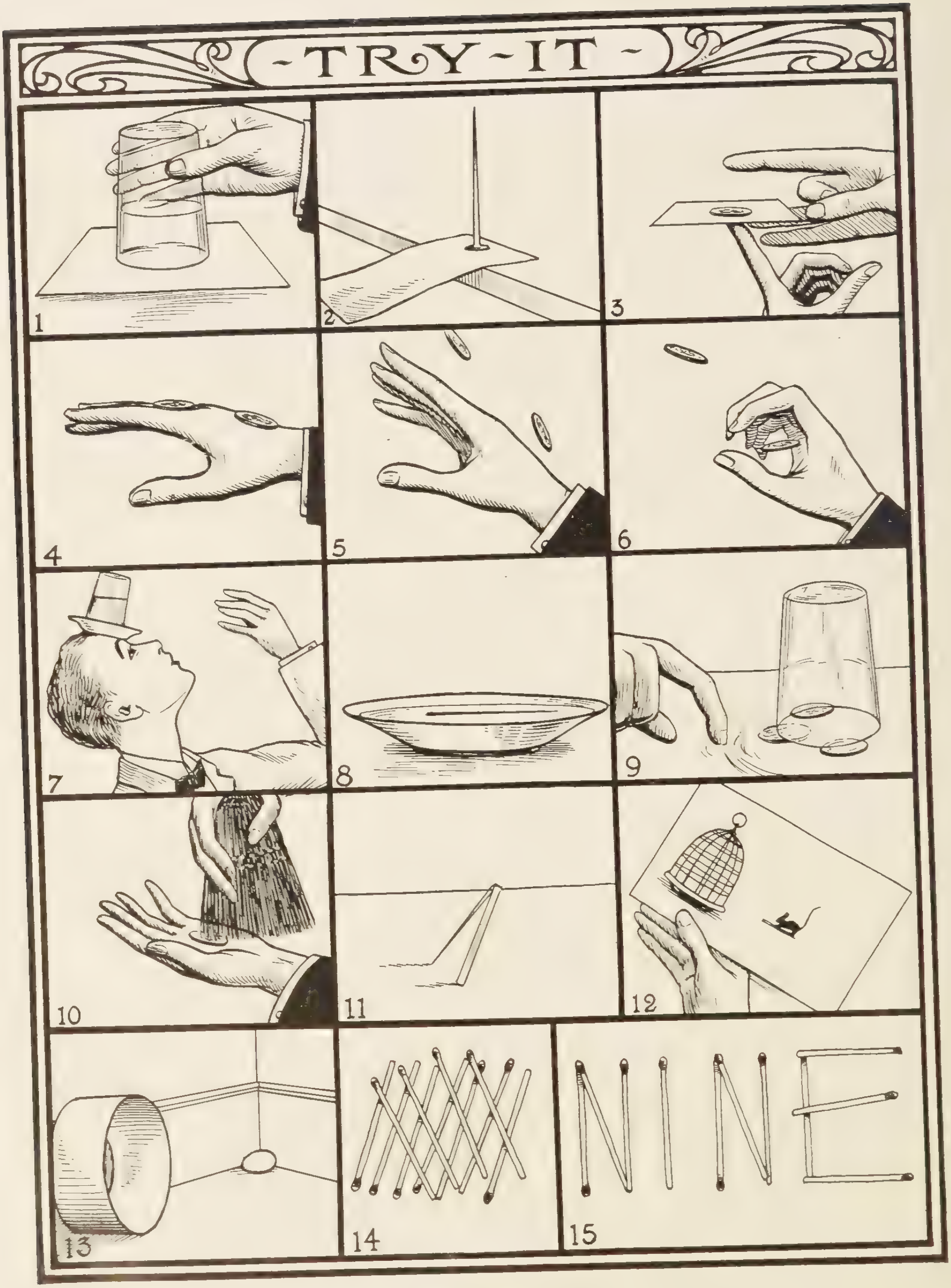
WHY CAN MORE THAN TWO PERSONS TALK OVER THE SAME TELEPHONE WIRE AT THE SAME TIME?

When we telephone, our voices are carried to the distant point in the form of a small electric current. Each telephone line, therefore, must have two wires, so as to make a complete circuit for the electric current. If four persons were to try to carry on two different conversations over the same pair of wires, they would find it difficult, since every word spoken could be heard by all four persons. It is possible, however, for six persons to carry on three different conversations at the same time over two pairs of wires without interfering with one another in any way.

Suppose that two ordinary telephone circuits between two towns have been sufficient to handle all the telephone business between these towns in the past, but that now an additional circuit is needed. Instead of installing a new set of wires, what is called a "phantom circuit" can be obtained by using the two wires of the first circuit for one wire of the phantom circuit, and the two wires of the second circuit for the other wire of the phantom circuit. By this arrangement the electric current which carries the voices of the two persons using the phantom circuit divides equally between the two wires of the original circuits and produces no effect in the telephones connected to them. Every large town and city has many of these phantom circuits.

HOW IS THE HEIGHT OF A MOUNTAIN MEASURED?

Accurate measurements can be taken by surveying, but the most common method is by measuring the height of the mercury column in a barometer. This shows the weight of the air above the mountain. (See Volume I, page 74.)



A DOZEN SIMPLE TRICKS

Can you do them all? If not, read the explanation of Figures 1–15 on the opposite page.

IF

IF you want to mystify your friends, learn to do a few of these simple tricks. How many of those on the opposite page have you tried? Can you turn a glass of water upside down without spilling it (Figure 1)? Place a sheet of paper over the mouth of a glass partially filled with water. Holding the left hand over the paper to keep it in position, reverse the glass. If you remove your hand very gently, the paper will be found to adhere to the glass and, to your surprise, prevent the water from flowing out.

Can you pull a piece of paper out from under a nail without disturbing the nail? Balance a nail on a small piece of paper at the edge of a table, as shown in the illustration (Figure 2). Hold your left hand three or four inches below the paper; bring the forefinger of the right hand down quickly and sharply on the paper, with the left hand under it to receive the blow. You will find that you have pulled the paper out and the nail is still standing upright. Figure 3 shows a similar trick with a coin balanced on a card on the forefinger of the left hand. With practice you can snap the card out with the forefinger of the right hand, leaving the coin balanced on the finger.

The trick shown in Figures 4, 5, and 6 is a little more difficult. Place two coins on the back of the hand, about an inch apart. Toss them into the air and catch them one at a time with the hand in the position shown in Figure 6. When you have mastered the art of catching two coins, try three.

Figure 7 is a famous magician's trick. If a person puts a saucer over the mouth of a tumbler partly filled with water, inverts the glass and the saucer, sets the two on the table, and tells you to drink the glass of water, touching it only with one hand, what will you do? Your tumbler is turned mouth down over the saucer. If you pick it up, the water will run out. Lift the saucer very carefully and rest it on the forehead (Figure 7). When the glass and saucer are well balanced, take firm hold of the glass and tip the head quickly forward, being sure to press the glass firmly against the forehead. You will be able to lift the glass off, set it upon the table, lift the saucer, and drink the water; and you will have used only one hand.

Will steel float on water? A steel needle will (Figure 8), *if* you have rubbed it between your fingers. It will have taken up enough oil from your skin to make a little invisible cushion, for oil and water will never mix.

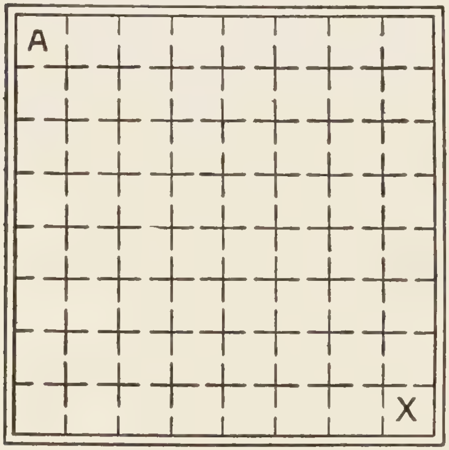
When you have your audience keyed up to the idea that you are doing very skillful tricks, requiring long practice, ask them if they can remove a coin from under a tumbler without touching it. They will, of course, respond that they cannot. Arrange your tumbler and coins on the table as in Figure 9, making sure that there is a tablecloth underneath. Scratch the tablecloth lightly, concealing the movement as much as possible, and the coins will come out from under the rim of the glass.

If a coin is placed in the palm of the hand as shown in Figure 10, can it be brushed out with a whisk broom? Try it. Bend a toothpick and hang it on a piece of thread, as shown in Figure 11. Take hold of the two ends of the thread and hold it as taut and steady as you can, with the toothpick at a slight angle instead of perfectly upright, and with both ends of the toothpick touching the table. The toothpick will walk along until it reaches one of the hands.

Can you put the mouse in the trap (Figure 12)? Make a rough sketch of a mouse and a trap, three or four inches apart, on a piece of paper. Hold the picture about a foot from the eyes; then gradually bring it nearer and nearer to the eyes, and see what happens. Can you break an egg with a peck measure? Not if the egg is in the corner of the room. Can you take eleven matches and make nine without taking any away? Study Figures 14 and 15.

THE OPEN DOOR

A prisoner placed in the cell marked *A* is promised his release on the condition that he

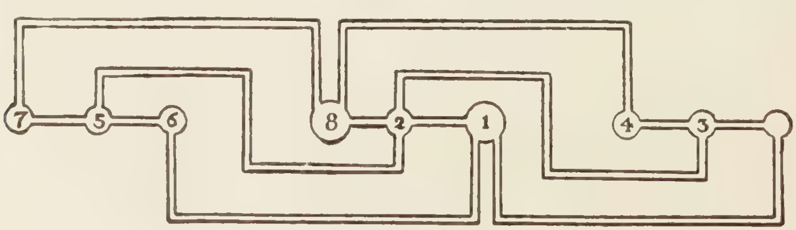


find his way out of the door at *X* by passing through all the cells, entering each of them once only. (For solution see page 216.)

THE DANGEROUS PRISONERS

Once upon a time there were eight desperate criminals confined in separate cells connected by the system of passages shown in our illustration. The prisoners, each of whom had his number, occupied cells in the order shown. One day the governor of the prison decided that his prisoners should be transferred from one cell to another in order that their numbers should run consecutively from left to right. Accordingly he gave orders for this to be done, but at the same time directed his wardens on no account to allow any two prisoners to meet, either in the passages or cells. As there was only one vacant cell at their disposal, how did the wardens work this maneuver successfully?

You will find the best way to solve this problem is to draw a plan similar to that shown in the picture, but on a much larger scale, and to place eight numbered counters or checkers in the respective cells. (For solution see page 216.)



A MYSTIFYING TRICK

Go into an adjoining room, requesting anyone in your absence to throw a pair of dice, observe the total resulting sum, add to it the number of points on the under side of the single die at the right, and cover the latter with his hand. Upon your return you can name immediately the exact total added. The solution is very simple. The sum of the points upon the opposite sides of every die is invariably seven. Knowing the number of points upon the covered die to be always seven, and with the other die left exposed to your view, it is easy to add seven to the number of points visible, and thus name at once the correct sum, to the surprise of your audience. It is a good plan not to seem to notice the exposed die. The attention of the company may be distracted by placing your finger upon the pulse of the person whose hand covers the die, thus giving the impression that you are trying to learn the correct sum by mind reading.

A TRICK WITH DOMINOES

Before performing this trick select twelve dominoes whose points number one, two, three, etc., up to twelve, and place them so that they range from left to right in regular order, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1. Now ask anyone to transfer as many pieces as he pleases from right to left, during your absence from the

room, promising to declare upon your return how many men have been moved and to uncover the domino which will show the exact number. To perform this feat, count from the first piece at the left until you reach the thirteenth domino. Turn this piece over and your audience will find that it bears the exact number of pieces that were transferred. It is essential that the dominoes be kept in regular order and moved only one at a time, always from right to left.

A TRICKY COURSE

The middle of a large playground was paved with sixty-four square flagstones of equal size, which are numbered on this diagram from 1 to 64.

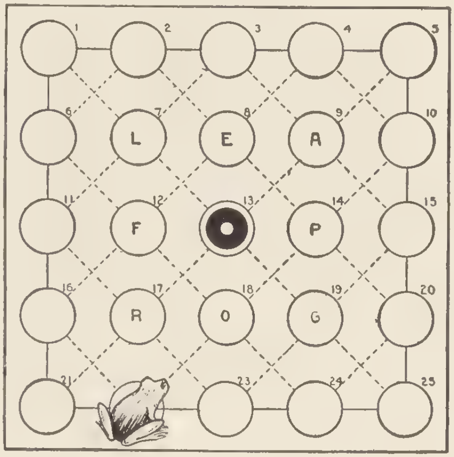
1	9	17	25	33	41	49	57
2	10	18	26	34	42	50	58
3	11	19	27	35	43	51	59
4	12	20	28	36	44	52	60
5	13	21	29	37	45	53	61
6	14	22	30	38	46	54	62
7	15	23	31	39	47	55	63
8	16	24	32	40	48	56	64

One of the schoolmasters took his stand upon the square here numbered 19, and offered a prize to any boy who, starting from the square numbered 46, could make his way to him, passing through every square once, and only once. It was after many vain attempts that the course was at last discovered. (For solution see page 216.)

SECOND SIGHT

Ask a friend to take a nickel or dime from his pocket and, without showing it to you, ascertain the date of the coin. Then let him turn it face upward on the palm of his hand. You then say that you can tell him the exact date.

Appear to scrutinize the coin very attentively, and then, with the greatest gravity and impressiveness, tell the owner of the coin the actual day of the month, and smile complacently at his wrath at being thus easily fooled.



LEAPFROG

Here is an interesting puzzle which can be worked out with coins or counters on a corner of a chess or checkerboard.

At starting only the central point is vacant. A piece that is moved to a vacant spot must leap over two other pieces if it goes along the solid black lines, and can only move over one of the dotted diagonals at a time to an adjoining point. Try, on these lines, to enable the frog, now in the second hole of the lowest row, to reach the center in the fewest possible moves, leaving its own original point vacant, and at the last surrounded by the words "leapfrog" as they now stand.

Moves may be made only to vacant places. (For solution see page 216.)

WHAT SLEIGHT-OF-HAND TRICKS CAN YOU LEARN TO DO?

See Volume VI, pages 288–294.

HOW CAN YOU MAKE A SET OF PARLOR QUOITS?

See Volume VII, page 68.

CONUNDRUMS

(For answers see page 115.)

I. My first makes company,
My second shuns company,
My third assembles company,
My whole puzzles company.

II. What was the longest day of which the Bible speaks?

III. Why is an orange like a church steeple?

IV. Give the positive, comparative, and superlative degrees of getting on in the world.

V. What is the difference between perseverance and obstinacy?

VI. If a woman were to change her sex, how would this affect her religion?

VII. What is the difference between a gardener and a Chinaman?

VIII. What sort of men are always aboveboard?

IX. If you were to throw a white stone into the Red Sea, what would it become?

X. Why is Sunday the strongest day?

XI. Why is a cook more noisy than a gong?

XII. What sea would make the best sleeping room?

XIII. What is the gentlest kind of spur?

XIV. When is an onion like music?

XV. What is the difference between a man going upstairs and a man looking upstairs?

XVI. What is the difference between a dollar bill and a silver quarter?

XVII. What can you put in a barrel to make it weigh less?

XVIII. How do you spell Blind Pig in two letters?

XIX. Where does all the snuff go to?

XX. Why is a steel trap like the smallpox?

XXI. Why would Samson have made an excellent actor?

XXII. What enlightens the world though dark itself?

XXIII. Why is the letter D like a band of gold?

XXIV. What confection did they have in the ark?

XXV.
What does man love more than life,
Hate more than death or mortal strife;
That which contented men desire,
Which poor men have, and rich require;
The miser spends, the spendthrift saves,
And all men carry to their graves?

XXVI. Why are hens the most economical things a farmer can keep?

XXVII. What tree bears the most fruit to market?

XXVIII. Which of the seasons is the most literary?

XXIX. What is the most dangerous time of the year to go into the country?

XXX. My *second* worried my *first* and proved himself my *whole*.

XXXI. Spell rat trap with three letters.

XXXII. Why do black sheep eat less than white ones?

XXXIII. What is majesty deprived of its externals?

XXXIV. What is the oldest piece of furniture in the world?

XXXV. What is smaller than a flea's mouth?

XXXVI. When is a clock on the stairs dangerous?

XXXVII. What is lengthened by being cut at both ends?

XXXVIII. Why is a false friend like the letter P?

XXXIX. Why is A like twelve o'clock?

XL. What musical keys should a man study when he is walking on ice?

XLI. Take away one letter from me and I murder; take away two and I probably shall die, if my whole does not save me.

XLII. Where did Noah strike the first nail in the ark?

XLIII. What is the best way to prevent water coming into your house?

XLIV. Why is the Panama Canal like the first *u* in cucumber?

XLV. Tie a cross to a monkey, and the animal will be transposed into a point.

XLVI. What is that which never asks questions, yet requires many answers?

XLVII. What is it we all say we will do,

recommend others to do, and yet no one has ever done?

XLVIII. What ship carries the most passengers?

XLIX. What is it that we are often struck by, yet never see?

L. What key in music will make a good officer?

LI. What is the keynote to good manners?

LII. What letter is the center of gravity?

LIII. When are the clouds in danger of being overturned?

LIV. Why is O the noisiest of all the vowels?

LV. What kin is that child to its own father who is not its own father's son?

LVI. What is a put-up job?

LVII. What words in our language have all the vowels in alphabetical order?

LVIII. What is the difference between a jeweler and a jailer?

LIX. Why is O the most charitable letter in the alphabet?

LX. What is that of which if you take the whole away some remains?

LXI. Plant the setting sun and what will come up?

LXII. Which has most legs, a horse or no horse?

LXIII. Which were made first, elbows or knees?

LXIV. Why is a woman driving nails like lightning?

TONGUE TWISTERS

I

Betty Botta bought some butter,
"But," she said, "this butter is bitter,
But a bit o' better butter
Will but make my batter better."

So she bought a bit o' butter,
Better than the bitter butter,
And it made her batter better,
So 't was better Betty Botta
Bought a bit o' better butter.

II

How much wood would a woodchuck chuck if a woodchuck could chuck wood? He would chuck, he would, as much as he could, and chuck as much wood as a woodchuck would if a woodchuck could chuck wood.

III

A Thatcher of Thatchwood went to Thatchet a-thatching;
Did a Thatcher of Thatchwood go to Thatchet a-thatching?
If a Thatcher of Thatchwood went to Thatchet a-thatching,
Where's the thatching the thatcher of Thatchwood has thatched?

IV

Bill had a billboard. Bill also had a board bill. The board bill bored Bill, so that Bill sold the billboard to pay his board bill. So after Bill sold his billboard to pay his board bill the board bill no longer bored Bill.

V

She sells seashells on the seashore. The shells she sells are seashells, I'm sure. So if she sells seashells on the seashore, then I'm sure she sells seashore shells.

VI

Susan shineth shoes and socks, socks and shoes shines Susan. She ceaseth shining shoes and socks for shoes and socks shock Susan.

VII

Sally Simm saw Sadie Slee
Slowly, sadly swinging.
"She seems sorrowful," said she,
So she started singing.
Sadie smiled: soon swiftly swung;
Sitting straight, steered stiffly.
"So!" said Sally, "something sung
Scatters sunshine swiftly!"

VIII

Crazy Craycroft caught a crate of crickled crabs.
Did Crazy Craycroft catch a crate of crickled crabs?
If Crazy Craycroft caught a crate of crickled crabs,
Where's the crate of crickled crabs Crazy Craycroft caught?

IX

Lanky Lawrence lost his lass and lobster.
Did Lanky Lawrence lose his lass and lobster?
If Lanky Lawrence lost his lass and lobster,
Where's the lass and lobster Lanky Lawrence lost?

X

When a twiner a twisting will twist him a twist,
For the twining his twist he doth three times entwist;
But if one of the twines of the twist do untwist,
The twine that untwisteth, untwisteth the twist.

Untwirling the twine that untwisteth between,
He twists in his twister the two in a twine;
Then twice having twisted the twines of the twine,
He twisteth the twines he had twisted in vain.

The twain that, in twisting before in the twine,
As twines were entwisted, he now doth untwine,
'Twixt the twain intertwisting a twine more between
He, twisting his twister, makes a twist of the twine.

XI

Andrew Airpump asked his Aunt her Ailment.
Did Andrew Airpump ask his Aunt her Ailment?
If Andrew Airpump ask'd his Aunt her Ailment,
Where was the Ailment of Andrew Airpump's Aunt?

XII

The guide was guiding a guy. As the guide guided the guy, the guide guyed the guy, until the guy would no longer be guided by a guide whom he had hired not to guy but to guide. So the guyed guy guyed the guide. No wonder everybody guyed the guyed guide guiding a guyed guy.

XIII

Two toads, totally tired, tried to trot to Tedbury.

XIV

Six slick slim slippery saplings.

XV

Strict, strong Stephen Stringer snared slickly six sickly, silky snakes.

XVI

Swan swam over the sea;
Swim, Swan, swim;
Swan swam back again;
Well swam, Swan.

XVII

Give Grimes Tim's gilt gig whip.

XVIII

The sea ceaseth and it sufficeth us.

XIX

Matthew Mendleggs miss'd a mangled monkey.
Did Matthew Mendleggs miss a mangled monkey?
If Matthew Mendleggs missed a mangled monkey,
Where is the mangled monkey that Matthew Mendleggs missed?

XX

Needy Noodle nipped his neighbor's nutmegs,
Did Needy Noodle nip his neighbor's nutmegs?
If Needy Noodle nipped his neighbor's nutmegs,
Where are his neighbor's nutmegs that Needy Noodle nipped?

XXI

What a shame such a shapely sack should such shabby stitches show!

XXII

Simple Simon Simpkins, a slim stripling, slipped from a slender sapling into a slimy slough hole.

XXIII

She stood at the door of Mrs. Smith's fish-sauce shop welcoming him in.

My dear little children you doubtless have heard
That the first worm is caught by the earliest bird.
Mrs. Duck, with her specs. and her bonnet of blue,
Is wishing that she had a lovely worm too.

PUZZLES AND ENIGMAS

(For answers see page 116. Try to guess them before you look.)

I. PIED PROVERBS

1. Enw osomrb peesw necal.
2. Thors sickergonn kame gonl dirsenf.
3. Tisceseny si eht homert fo nitovienn.
4. Ifen satehefr od nto keam einf sdbir.
5. Eh siveg citew tath vegis ni a cetir.

II. CAKE PUZZLE

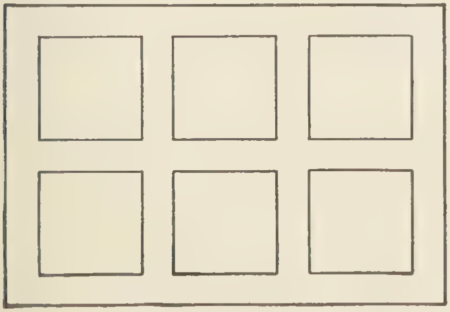
What kind of cake would you buy for (1) sculptors; (2) politicians; (3) geologists; (4) advertisers; (5) dairymen; (6) milliners; (7) his Satanic Majesty; (8) babies; (9) lovers; (10) the betrothed; (11) gossips; (12) carpenters; (13) idlers; (14) pugilists; (15) one who lives on his friends; (16) dynamiters; (17) invalids; (18) convalescents?

III. THE CAT PUZZLE

What sort of a cat (1) is allowed in a library; (2) unites well with a toilet article; (3) requires a physician's care; (4) is feared by soldiers; (5) is bad for the eyes; (6) is to be dreaded; (7) is allowed on the table; (8) goes to Sunday school; (9) do girls most detest; (10) makes small boys weep?

IV. A GEOMETRICAL PUZZLE

A hospital was built in six detached blocks, and it was the duty of the night watchman to go completely round every block at fixed hours to see that all was safe. What was his shortest course?



V. THREE SQUARES

A. 1. A girl's name. 2. Not far. 3. Part of the body. 4. A vestibule.

B. 1. Brought up. 2. A part performed by an actor. 3. Otherwise. 4. An illustrious act.

C. 1. Misgiving. 2. Proprietor. 3. A relative. 4. Girdles. 5. A lock of hair.

VI. LOST RHYMES

Said Billy, "I will fly my ——
Way up yonder mountain ——."
The kite was large, the wind was ——,
And Spot sat watching wisely ——.
The kite went flying to the ——,
And then, to Spot's intense ——,
The string got caught, as kite-strings ——,
And Billy went a-flying ——.

VII. FALSE COMPARATIVES

Positive, a relish; comparative, a small dish.

Positive, a kind of pastry; comparative, a tyrant.

Positive, a rug; comparative, a substance.

Positive, a famous city; comparative, a wanderer.

Positive, a bird; comparative, a peddler.

Positive, two; comparative, trouble.

VIII. GEOGRAPHICAL PUZZLE

Supply geographical names for the italicized words:

A city of Italy (1) went to visit *a river of Siberia* (2). *The city of Italy* (3), being used to a warm climate, dressed herself in *an island of Scotland* (4), with a jacket of *one of the Channel Islands* (5), and she wore an *Italian city* (6) hat. *The river in Siberia* (7) wore a *city of Russia* (8) cloak and a *cape of Nova Scotia* (9) cap. The weather was *the southern part of Ireland* (10), but also *a country of South America* (11). So the two, guest and hostess, ran a *cape in North America* (12) to get warm. They took some very brisk *plains in Russia* (13), and then, for lunch, ate an *island in the Pacific* (14) and a *city*

in Italy (15). At dinner they had a *river in South America* (16) to wait upon them. They had *a strait of Australia* (17) and *a cape of Massachusetts* (18) for the first course. After that *a country of Europe* (19) cooked in *another country of Europe* (20). For dessert they had *a river in Africa* (21) and *a river in Michigan* (22). Everyone drank a cup of *an East Indies Island* (23). And then, though some people might think it *an island in the English Channel* (24), they all ate *some islands in the Pacific Archipelago* (25).

Then *the city of Italy* (26) bade a gracious *cape of Greenland* (27) to *the river of Siberia* (28), and went home no more to *chief city of Italy* (29).

IX. RHYMED NUMERICAL ENIGMA

Although he writes of 12–13–7–9–5, his tales are never 3–5–6–8.
He's just as open as the 7–5–4, as merry as a 11–5–6–8;
Though lions 10–11–5–4 in jungles, and tigers 11–2–1–8 in shade,
And 14–6–5–4 wolves 14–1–9–13 2–13–8–12–13–7–11–4, no 1–2–3–7–4 child 's afraid;
Though elephant and jackal, and ape, that missing 11–9–13–8,
Come in the 11–2–6–12–3 moonlight down to the 1–9–11–11 to 7–1–12–13–8.
Long may his jolly poems 6–9–13–14, his 14–5–4 pen 3–2–11–4 10–11–4,
For of story tellers he is 8–12–13–14; may his 9–13–8 never 6–2–13–3–1–4.

X. DROPPED LETTERS

"-i-t-e-l-n-i-h-p-i-e-s."

XI. PROBLEM IN ADDITION

Take almost all, and a part of all, then one fourth of same and one third of one, and find more of the same.

XII. PIED QUOTATION

"Ew dolush tonuc mite yb thaer-strobh. Eh stom veils
How skthin tosm, lefes het blonest, tacs eth steb."

XIII. LONGFELLOW PUZZLE

Answer each of the following questions by giving the title of one of Longfellow's poems:

1. What poem is it that helps to shoe your horse?
2. What poem needs an umbrella?
3. What poem carries you across the river?
4. What poem finds you weary?
5. What poem keeps the time?
6. What poem belongs to little people?

XIV. FAMOUS PERSONS

What famous persons do these objects suggest?

1. Hatchet.	10. A silver lamp.
2. A rail fence.	11. A smooth, round stone.
3. A kite.	12. Long hair.
4. A muddy cloak.	13. A dove.
5. A lonely island.	14. A spider web.
6. A burning bush.	15. A key.
7. A ruff.	16. A wolf.
8. A glass slipper.	17. A steamboat.
9. An apple.	18. A loaf of bread.

XV. THE FLOWER GARDEN

If you plant the following, what will come up?

1. A box of candy.
2. Some steps.
3. Days, months, and years.
4. A sorrow.
5. Cuff on the ear.
6. Cinderella at midnight.
7. Claws and a roar.
8. A Richmond caterpillar.
9. Contentment.
10. Sad beauties.
11. Labyrinth.

XVI. AN EASY ONE

Turn these six words into one word:
I excel not by a pun.

XVII. RHYMING PUZZLE

Substitute for each number in parentheses a double letter of the alphabet:

There is a farmer who is (1)
Enough to take his (2)
And study Nature with his (3)
And think on what he (4)

He hears the chatter of the (5)
As they each other (6)
And sees that when a tree de (7)
It makes a home for (8)

A yoke of oxen will be (9)
With many haws and (10)
And their mistakes he will ex (11)
When plowing for his (12)

He little buys, but much he se (13)
And therefore little (14)
And when he hoes his soil by spe (15)
He also soils his h (16)

XVIII. BURIED NAMES

1. Let me hope, kind friends, for your good will.
2. The prettiest children are not always the best.
3. It was a mad rascal who stole the jewels.
4. While firing a bomb, a young artilleryman shot off his finger.
5. Generally, on Sundays, people dine at two o'clock.
6. The same day that saw the outbreak of war saw also the advance of the French.
7. Where is the "Saturday Review" published?
8. December never came in so mildly before.
9. Americans think that royalty ought to be abolished.

XIX. SHAKESPEARIAN PUZZLE: A ROMANCE

Answer each question with the name of one of Shakespeare's plays:
1. Who were the lovers?
2. What was their courtship like?
3. What was her answer to his proposal?
4. About what time of the month were they married?
5. Of whom did he buy the ring?
6. Who were the best man and the maid of honor?
7. Who were the ushers?
8. Who gave the reception?
9. In what kind of a place did they live?
10. What was her disposition like?
11. What was his chief occupation after marriage?
12. What caused their first quarrel?
13. What did their courtship prove to be?
14. What did their married life resemble?
15. What did they give each other?
16. After they were reconciled, what did their friends say?

XX. HOW TO FIND OUT A PERSON'S AGE

Ask the person to write down the number of his birth month and multiply it by 2. Then tell him to add 5, and multiply the result by 50; next, to add his present age to the result thus obtained, and last, to subtract 365. Ask what number is left, and to it add 115. The figures to the right of the total will be the age; those to the left, the number of the birth month.

XXI. BURIED NAMES OF NOTED PERSONS

1. To quicken vegetation and stimulate its sap, phosphates are largely employed.
2. Children pop everything into their mouths.
3. In the island of Serendib dinner consists of rice.
4. Man goeth every day to his labor till the evening.
5. The joint was so lean, derisive shouts greeted its appearance.
6. When her father began to scold, she rose and left the room.
7. If I had a coal pit, the miners should use the safety lamp.
8. The taste for fox hunting is peculiar to the English.

XXII. SUGGESTIONS FOR AN AUCTION SALE

1. A Masterpiece — Whistler.
2. Study of a Head.
3. Clothespress.
4. Irish Bric-à-brac.
5. Patent Skirt Lifter.
6. A Cent's Worth of Solace.
7. A Marble Bust.
8. Reminder of an Impecunious Friend.
9. Emblem of Justice.
10. Lubin's Tear Extract.

11. Profanity Educators.
12. A Perfect Foot.

XXIII. TRANSLATING

Translate the following letters into a sentence of sixteen words:

Y Y U R Y Y U B I C U R Y Y 4 M E

XXIV. ARITHMETIC PROBLEM

A number of sheep were going into a field. There was a sheep before two sheep, a sheep behind two sheep, and a sheep between two sheep. How many sheep were going into the field?

XXV. SHIFTING LETTERS

I am bright as a whole
  Till you cut off my head;
Then as black as a coal,
  Or a mortal instead.
Shaken up and recast
  We with science are found.
Read up back from the last
  And we live underground.

XXVI. A SQUARE

Fill the places of these twenty-one asterisks with only three different letters, arranging them so that they spell a common English word in twelve different directions.

*	*	*	*	*
*	*		*	*
*		*		*
*	*		*	*
*	*	*	*	*

XXVII. WORD PUZZLE

Take the letters which form the words in these sixteen cells, and recast them so that they form a perfect word square.

A	F	A	R
T	A	S	K
S	E	A	T
L	E	A	L

XXVIII. HIDDEN PROVERBS

Find the five familiar proverbs hidden in this square of 169 letters. The proverbs are arranged in a regular sequence, but the words move both vertically and horizontally, to the left and to the right.

r	e	n	o	w	n	e	d	t	h	a	n	w
s	y	o	u	r	c	a	k	e	a	n	d	a
s	t	e	t	o	b	e	f	e	a	r	h	r
e	a	r	k	s	s	p	o	i	l	e	a	f
l	e	o	o	h	e	r	s	n	t	d	v	o
o	t	m	o	t	l	i	n	o	h	t	e	u
n	o	s	c	a	l	a	g	m	e	h	i	r
s	n	i	y	g	o	r	s	o	b	a	t	s
e	n	g	n	e	n	o	t	s	r	n	p	a
i	a	o	a	m	o	o	t	s	o	a	e	w
r	c	d	e	v	i	l	a	h	t	d	a	s
o	u	o	y	n	o	i	l	d	a	e	c	a
t	c	i	v	r	e	h	h	t	a	h	e	z

XXIX. REBUS

I am
  a man
I rate you
  a beast
You know me

XXX. BYRON'S ENIGMA

I am not in youth, nor in manhood, nor age,
But in infancy ever am known;
I'm a stranger alike to the fool and the sage,
And though I'm distinguished in history's page
I always am greatest alone.

I am not in earth, nor the sun, nor the moon;
You may search all the sky — I'm not there;
In the morning and evening — though not in the noon —
You may plainly perceive me — for, like a balloon,
I am midway suspended in air.

XXXI. BURIED POETS

Eight poets' names are buried in these lines:

The sun is darting rays of gold
Upon the moor, enchanting spot;
Whose purpled heights, by Ronald loved,
Up open to his shepherd cot.

And sundry denizens of air
Are flying — aye, each to his nest;
And eager make at such an hour
All haste to reach the mansions blest.

XXXII. A NUMERICAL PUZZLE

Six hundred and sixty so ordered may be
That if you divide the whole number by three
You find the result will exactly express
The half of six hundred and sixty, no less.

XXXIII. PART OF AN OLD ENIGMA

I'm English, I'm German, I'm French, and I'm Dutch;
Some love me too dearly, some slight me too much;
I often die young, though I sometimes live ages,
And no queen is attended by so many pages.

XXXIV. WHAT DOES THIS SPELL?

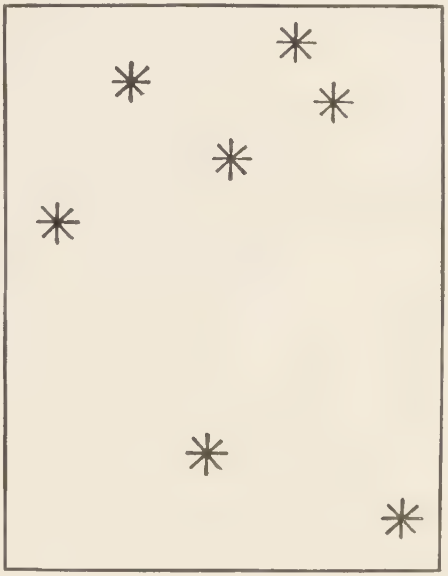
$$\frac{C}{TTTTTTTTTT}$$

XXXV. WORD PUZZLE

Though disease may possess me, and sickness and pain,
I am never in sorrow nor gloom;
Though in wit and in wisdom I equally reign,
I'm the heart of all sin, and have long lived in vain,
Yet I ne'er shall be found in the tomb!

XXXVI. GEOMETRICAL PUZZLES

1. What is the smallest number of straight lines which can be drawn within this square so as to inclose each of the stars within separate boundaries?



2. Draw on paper or cardboard a figure like this, and in the simplest way possible divide it into four equal and similar parts by four straight cuts.

XXXVII. A CHARADE

My first of rudeness has a sound;
The rest is in a city found;
My whole to win its way is bound.

XXXVIII. AN ENIGMA

This compact enigma take,
All apart its letters shake.
Let your 6–3–5 be high,
Like 5–1–2 do or die,
Who 4–6–5–1 enjoys
More than 5–6–2 by boys?
While 5–3–2–1 are mine,
May 4–6–3–2 be thine.
4–1–5 is rich and rare,
6–5–1–2 ends my prayer.

XXXIX. THE CIPHER PUZZLE

1

You O a O
But I O thee;
O, O no O
But O O me.

2

And O let my O
Thy O be;
And give O O
I O thee.

XL

Translate the following words into a sentence:

I C U B Y Y F O R M E

XLI. WORD PUZZLE

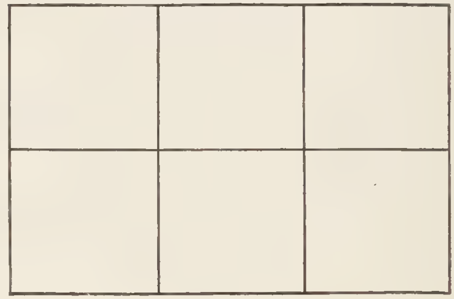
A noun there is, of plural number,
In daily use from here to Humber.
Now almost any noun you take
By adding "S" you plural make;
But if you add an "S" to this,
Strange is the metamorphosis!
Plural is plural now no more;
Useless what useful was before.

XLII

Recast *Red Nuts And Gin* so that they form one long word.

XLIII. THE MAGIC SQUARE

With seventeen matches make a figure like this. Remove five matches, and leave only three perfect squares of the same size remaining.



XLIV

Solve the problem in long division. The letters form a sentence of three words and represent the figures 1234 5678 90. Discover this sentence by solving the division.

```
UGI)GEVPPNDO(IDTPO
    GVNI
    ----
     DNTP
      UGI
     ----
     NETN
     NEOT
     ----
      DUDO
      DUDO
      ----
```

XLV

What is the longest word in the English language?

XLVI. A HIDDEN ANIMAL

A little beast without its head
Becomes a mighty beast instead;
But then the subject of my riddle
Is cut asunder in the middle;
And nothing this division gains,
Though unknown quantity remains.

XLVII

What word do these letters stand for?

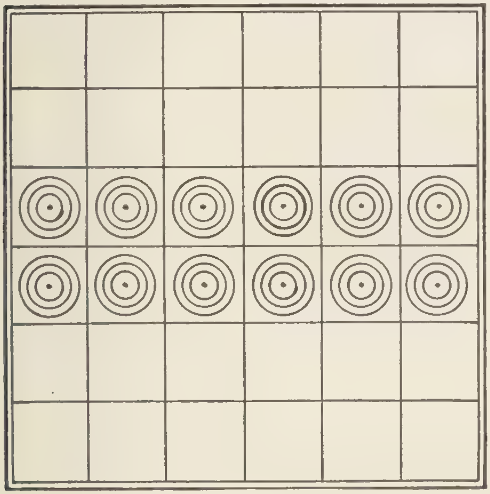
H A A T T C E U M S S S S

XLVIII

I lose my head when I am here;
Transpose me, I am three;
Look in a book, you find me there
And with me her and he.

XLIX. A PUZZLE

Rearrange the 12 counters on this board of 36 squares so that there will be 2 counters on each row, column, and diagonal, but not more than 2 counters in the same straight line.



ANSWERS TO CONUNDRUMS

I. Conundrum (Co — nun — drum).
II. The day without any Eve.
III. Because we have a peel from it.
IV. Get on; get honor; get honest.
V. One is a strong will and the other is a strong won't.
VI. She would be a he then (heathen).
VII. One keeps the lawn wet; the other keeps the laundry.
VIII. Chessmen.
IX. Wet.
X. Because the others are weak (week) days.
XI. One makes a din, the other a dinner.
XII. A-dri-atic.
XIII. Whisper.
XIV. When you find it smell odious (it's melodious).
XV. One steps up stairs, and the other stares up steps.
XVI. Seventy-five cents.
XVII. Holes.
XVIII. *Pg* — *pig* without an eye (*i*).
XIX. No one nose.
XX. Because it is catching.
XXI. Because he could so easily bring down the house.
XXII. Ink.
XXIII. Because *we* can't be *wed* without it.
XXIV. Preserved pairs (pears).
XXV. Nothing.
XXVI. Because for every grain they give a peck.
XXVII. The axle-tree.
XXVIII. Autumn, for then the leaves are turned, and some of them are red (read).
XXIX. When the trees are shooting, and the bulrushes out.
XXX. Bulldog.
XXXI. C-a-t.
XXXII. Because there are fewer of them.
XXXIII. A jest (m-ajest-y).
XXXIV. The multiplication table.
XXXV. What goes in it.
XXXVI. When it runs down and strikes one.
XXXVII. A ditch.
XXXVIII. Because though first in pity, he is always last in help.
XXXIX. It is the middle of the day.
XL. C sharp or B flat.
XLI. Kill-ill-skill.
XLII. On the head.
XLIII. Don't pay your water tax.
XLIV. Because it is between two seas.
XLV. Add *x* to *ape*, and you obtain *apex*.
XLVI. The door-knocker.
XLVII. Stop a minute.
XLVIII. Courtship.
XLIX. A passing remark.
L. A-sharp major.
LI. B natural.
LII. The letter V.
LIII. When they let the rains (reins) fall.
LIV. Because you can't make a *horrid loud noise* without it, while all the other vowels are in*audible*.
LV. His daughter.
LVI. The paper on the wall
LVII. Facetiously and abstemiously.
LVIII. One sells watches and the other watches cells.
LIX. It is found oftener than any other letter in *doing good*.
LX. Whole-some.
LXI. The morning glory.
LXII. No horse has five legs.
LXIII. Knees, for beasts were created before men.
LXIV. Because she never strikes twice in the same place.

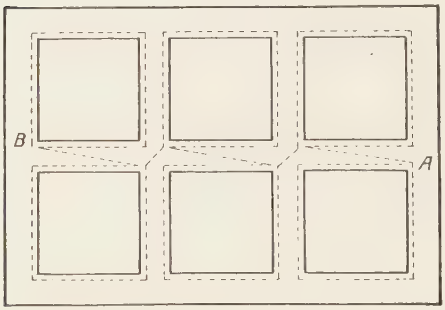
ANSWERS TO PUZZLES AND ENIGMAS

I. 1. New brooms sweep clean. 2. Short reckonings make long friends. 3. Necessity is the mother of invention. 4. Fine feathers do not make fine birds. 5. He gives twice that gives in a trice.

II. (1) Marble cake; (2) plum cake; (3) layer cake; (4) cream puffs; (5) cream cake; (6) ribbon cake; (7) angel's food; (8) patty cakes; (9) kisses; (10) bride's cake; (11) spice cake; (12) plane (plain) cake; (13) loaf cake; (14) pound cake; (15) sponge cake; (16) raisin cake; (17) delicate cake; (18) sunshine cake.

III. (1) *cat*alogue; (2) *cat*acomb; (3) *cat*alepsy; (4) *cat*apult; (5) *cat*aract; (6) *cat*astrophe; (7) *cat*sup; (8) *cat*echism; (9) *cat*erpillar; (10) *cat*-o'-nine-tails.

IV.



V.

A: Anna, Near, Nape, Area

B: Bred, Role, Else, Deed

C: Doubt, Owner, Uncle, Belts, Tress

VI. Kite, height, high, by, skies, surprise, do, too.

VII. Saucer, tartar, matter, roamer, hawker, bother.

VIII. 1. Florence. 2. Lena. 3. Florence. 4. Mull. 5. Jersey. 6. Leghorn. 7. Lena. 8. Astrakan. 9. Sable. 10. Clear. 11. Chiie. 12. Race. 13. Steppes. 14. Sandwich. 15. Bologna. 16. Negro. 17. Bass. 18. Cod. 19. Turkey. 20. Greece. 21. Orange(s). 22. Raisin(s). 23. Java. 24. Scilly. 25. Philippines. 26. Florence. 27. Farewell. 28. Lena. 29. Rome.

IX. Rudyard Kipling.

X. "Virtue alone is happiness."

XI. A-l-s-o. Also.

XII.

"We should count time by heart-throbs. He most lives,
Who thinks most, feels the noblest, acts the best."

XIII. 1. The Village Blacksmith. 2. The Rainy Day. 3. The Bridge. 4. The Day is Done. 5. The Old Clock on the Stairs. 6. The Children's Hour.

XIV. 1. George Washington. 2. Abraham Lincoln. 3. Benjamin Franklin. 4. Sir Walter Raleigh. 5. Robinson Crusoe. 6. Moses. 7. Queen Elizabeth. 8. Cinderella. 9. William Tell. 10. Aladdin. 11. David. 12. Samson. 13. Noah. 14. Robert Bruce. 15. Bluebeard. 16. Red Riding Hood. 17. Robert Fulton. 18. Benjamin Franklin.

XV. 1. Candytuft. 2. Hops. 3. Thyme. 4. Weeping willow. 5. Box. 6. Lady's slipper. 7. Tiger lilies. 8. Virginia creeper. 9. Heart's ease. 10. Bluebells. 11. Maize.

XVI. Unexceptionably.

XVII. 1 = YY; 2 = EE; 3 = II; 4 = CC; 5 = JJ; 6 = TT; 7 = KK; 8 = BB; 9 = UU; 10 = GG; 11 = QQ; 12 = PP; 13 = LL; 14 = OO; 15 = LL; 16 = OO.

XVIII. 1. Pekin. 2. Thebes. 3. Madras. 4. Bombay. 5. Lyons. 6. Warsaw. 7. Ayre. 8. Berne. 9. Troy.

XIX.
1. Romeo and Juliet.
2. Midsummer Night's Dream.
3. As You Like It.
4. Twelfth Night.
5. Merchant of Venice.
6. Antony and Cleopatra.
7. The Two Gentlemen of Verona.
8. Merry Wives of Windsor.
9. Hamlet.
10. The Tempest.
11. Taming of the Shrew.
12. Much Ado About Nothing.
13. Love's Labor's Lost.
14. A Comedy of Errors.
15. Measure for Measure.
16. All's Well That Ends Well.

XXI. 1. Sappho. 2. Pope. 3. Dibdin. 4. Goethe. 5. Leander. 6. Hero. 7. Pitt. 8. Fox.

XXII. 1. A whistle. 2. A cabbage. 3. A toy iron. 4. A potato. 5. A chocolate mouse. 6. A clay pipe. 7. A cracked marble. 8. A sponge. 9. Scales. 10. An onion. 11. Hammer and tacks. 12. A foot rule.

XXIII. Too wise you are, too wise you be,
I see you are too wise for me.

XXIV. Three sheep.

XXV. Star, tar, arts, rats.

XXVI.

```
L E V E L
E E   E E
V   V   V
E E   E E
L E V E L
```

XXVII.

```
F A S T
A R E A
S E A L
T A L K
```

XXVIII. A rolling stone gathers no moss. Too many cooks spoil the broth. A live dog is more to be feared than a dead lion. You cannot eat your cake and have it. Peace hath her victories no less renowned than war.

XXIX. I rate you lower than a man, above a beast. Know, between you and me, I am above the rest.

XXX. I.

XXXI. Gray, Moore, Byron, Pope, Dryden, Gay, Keats, Hemans.

XXXII. Turn 660 upside down, and it becomes 990.

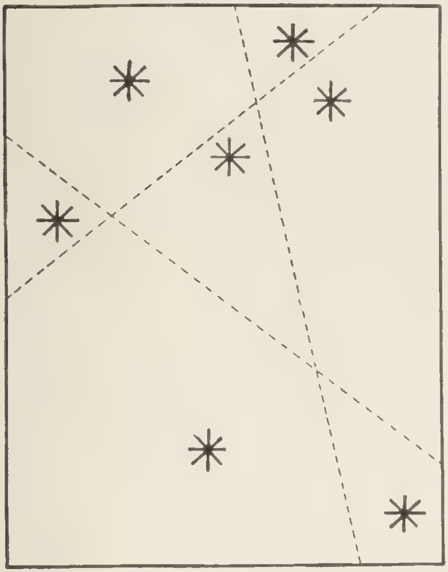
XXXIII. A book.

XXXIV. Contents (C on ten t's).

XXXV. I.

XXXVI.

I.



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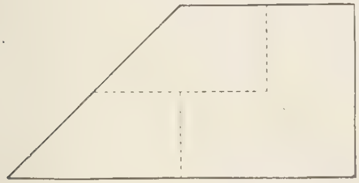


XXXVII. Pertinacity.

XXXVIII. Enigma.

XXXIX.

1

You sigh for a cipher,
But I sigh for thee;
O, sigh for no cipher,
But O sigh for me!

2

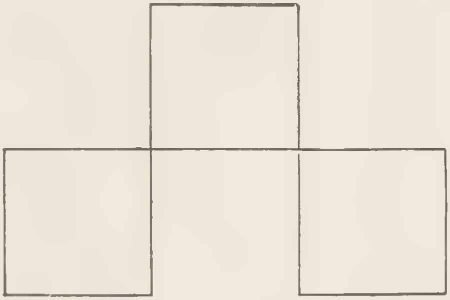
And O let my cipher
Thy cipher be!
And give sigh for sigh, for
I sigh for thee.

XL. I see you be
Too wise for me.

XLI. Needles, needless.

XLII. Understanding.

XLIII.



XLIV. Don't Give Up.

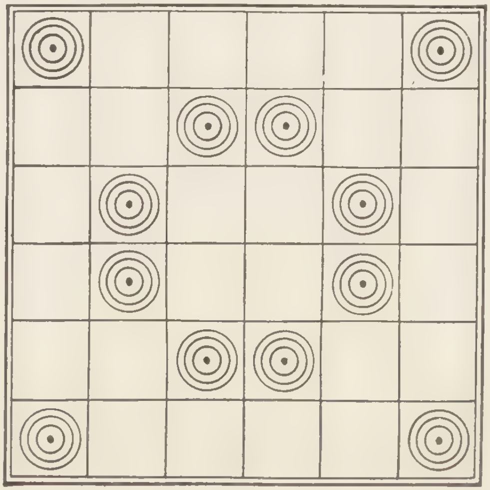
XLV. Transubstantiationableness.

XLVI. Fox, ox, o, x.

XLVII. Massachusetts.

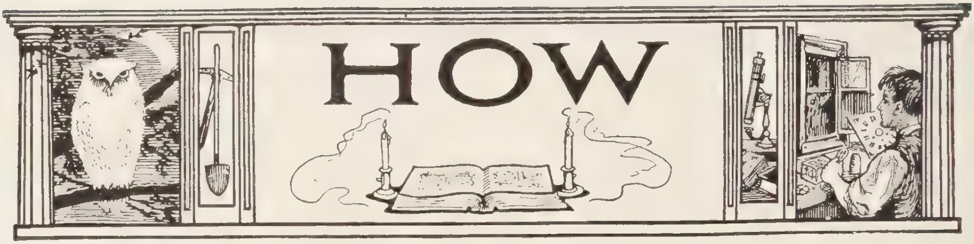
XLVIII. There.

XLIX. Several solutions are possible. This is one:



WHAT WORD GAMES CAN A COMPANY OF YOUNG PEOPLE PLAY TOGETHER?

See Volume VI, pages 280–282. For good words for charades, see page 216 of this volume.



HOW FAST DOES RAIN FALL?

WHEN the rainfall is so slight that it "sprinkles," the actual amount of water may not cover the ground to a greater depth than the one-hundredth part of an inch. In a hard shower lasting half an hour the rain falls to a depth of from half an inch to an inch. In a long-continued rainstorm, lasting a day or two, three or four inches of rain may fall; but in special instances enormous quantities of rain have fallen within brief periods. Thus in Louisiana a rainfall of 21.5 inches within twenty-four hours has occurred; in Japan as much as 29.5 inches has fallen in a day; and in India 39.5 inches fell in twenty-four hours, which is about as much as falls in the eastern United States in a whole year.

HOW DOES RAIN HAPPEN TO FALL IN DROPS?

When the minute particles of water that make a mist or cloud are carried in various directions by the air motions, and in this movement come in contact with each other, they unite to form globules which are too heavy to be supported by the air and therefore fall. The larger the raindrops formed, the more rapid is their fall. When they are blown about in the air for a considerable time before they fall to the ground, raindrops of very large size may be formed.

It is probable also that electrical action plays an important part in the formation of raindrops from cloud particles.

HOW FAST DOES THE AIR MOVE WHEN THE WIND IS BLOWING?

When the wind blows gently and makes the leaves of trees move slightly, the air is moving about five or six miles an hour; when the branches of trees sway slightly, about fifteen miles an hour; and when the large branches are moved, about twenty-five to thirty miles an hour. When small objects like sticks are blown along the ground and a person finds it difficult to walk against the wind and umbrellas are turned inside out, the air is moving at a speed of from forty to fifty miles an hour. When heavy objects are blown about, chimneys are blown over, signs are torn loose, and it is difficult to stand upright, the wind is blowing from fifty-five to seventy miles an hour. The speed of the wind seldom exceeds seventy miles an hour even in the great storms that ravage the coast, but in hurricanes it will blow at ninety or one hundred miles an hour, and in the narrow central path of a tornado at three and four and five hundred miles.

HOW DOES AMMONIA REMOVE DIRT?

Most things retain dirt because of some greasiness that holds the dirt particles. Ammonia softens and removes this grease by causing it to form an emulsion with water. The dirt comes away with the grease.

HOW DO ANIMALS SLEEP?

All animals sleep, but many of them in ways so curious that they seem to be awake. Ducks sleep on open water, and to keep from drifting ashore paddle with one foot continually, thus traveling in a slow circle. Bats sleep head downward, hanging by their hind claws. Some birds sleep with their heads turned backward and tucked under their wings. In addition to their eyelids owls have a curtain which they draw sidewise over their eyes. Many animals of the cat kind sleep with wide-open, staring eyes. Elephants sleep standing up, their heads slowly swinging as if they were awake. It is these and other curious attitudes that give rise to the stories that some animals do not sleep.

BLUE HILL OBSERVATORY, NEAR BOSTON, MASS.

Here kites were first used to sound the air by Professor A. Lawrence Rotch, in 1894.

READING THE SECRETS OF THE UPPER AIR

EVERYONE knows that the air becomes colder as we climb higher above the level of the sea. We have only to look at the everlasting snow upon the summits of lofty mountains to realize this fact. If we could continue our climb far above these summits, however, we should find a region about six and a half miles above the earth where the atmosphere stops growing colder and where the temperature may even rise very slightly for a certain distance. Whether we made our ascent at some point on the Equator, or in the Arctic or Antarctic Zone, no matter at what point on the surface of the globe, we should always find this curious zone, which men of science call the "isothermal layer" of the atmosphere, or the "stratosphere."

The investigation of the upper atmosphere is a branch of the science of meteorology. All over the world in recent years men have been trying to probe the mysterious empty space above our heads, in order to learn and to record new truths about the wind systems of the globe and the state of the air far away from the earth's surface.

These investigations have to do with heights where men would die of cold or lack of oxygen, even if they could find suitable conveyances; so the meteorologist makes use of several apparatuses to carry his ingenious recording instruments for miles overhead. These are of four kinds: the box kite, the pilot balloon, the captive balloon, and sounding balloons.

An American, Mr. A. Lawrence Rotch, at the Blue Hill Observatory, near Boston, in 1894, was the first to use kites, attached to steel wires, to lift self-recording instruments and so obtain records of the various conditions in the atmosphere. In 1907 eight kites in tandem carried a set of these instruments to a height of 23,111 feet above the sea. This record flight was made at a research observatory of the United States Weather Bureau in Virginia and has never been equaled, nor has any aviator yet guided his aëroplane to such an altitude.

The pilot balloon carries no instruments, nor does any line control its movements. The small spheres rise to immense heights and are eventually lost to sight in the high air. From these tiny guides, however, the meteorologist can tell the direction and the violence of the upper air currents. Every morning between seven and eight o'clock pilot balloons are sent up from fourteen stations in Germany. Observers follow their course, studying carefully

SENDING UP A BOX KITE

the behavior of the air currents at different heights by means of theodolites. The results of these observations are telegraphed to a central observatory, which issues daily bulletins, for the benefit of the many German balloonists or aviators who may be planning aërial excursions.

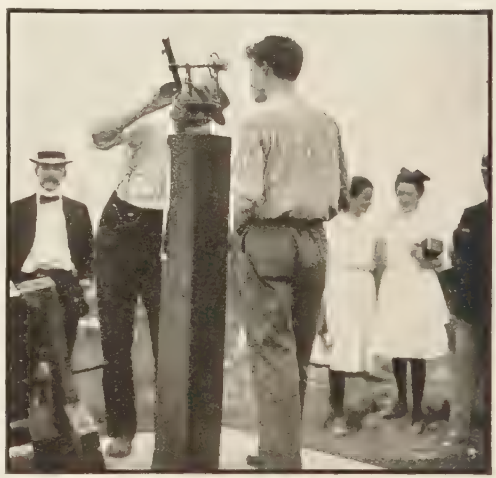
The captive balloon, as its name implies, is connected with the earth, usually by a light piano wire. Like the kite, these balloons carry somewhat heavy and complicated recording apparatus. They cannot get very high, however, as they have to lift the wire that holds them, and so they are used only in cloudy weather, when it would be impossible to follow the pilot balloons with a glass.

TWENTY-THREE MILES HIGH

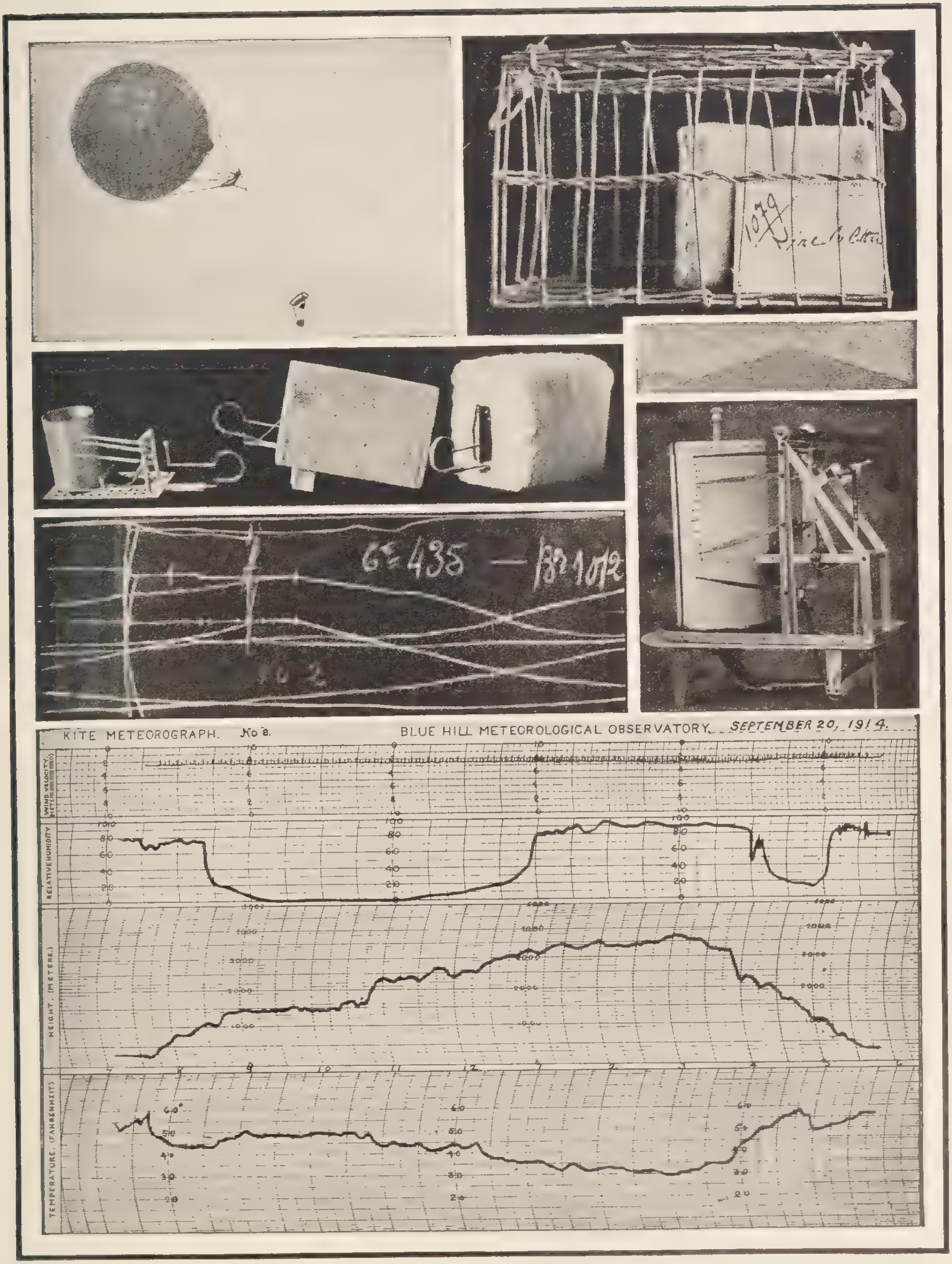
The sounding balloon is the most successful tool of the meteorologist, and with it he has been able to send instruments to the astonishing height of twenty-three miles. It is a small, free balloon, like that shown in our illustration, and carries a set of wonderful instruments. These usually register, by clockwork upon a sheet of metal or paper, the temperature of the air; the barometric pressure, which shows the height of the balloon at every stage of the flight; the humidity, or amount of moisture in the atmosphere; and the velocity of the wind. This set of instruments is called a "meteorograph." It is carefully inclosed within a cork or aluminum case, which is placed in a wicker basket — to prevent damage when it falls to the earth. The sounding balloon itself is made of pure India rubber. When launched it is about three feet in diameter and contains less than its full capacity of hydrogen gas. As the balloon rises into regions where the air pressure becomes less, it gradually expands and finally bursts at a great height, when a small parachute opens up and brings the precious instruments safely to earth. Sometimes the meteorograph comes down many miles from the spot where the balloon was started, but sooner or later it usually comes back by express, as the finder is offered a reward for its return.

THE STORY OF A FLIGHT

Sounding balloons have explored the air to greater heights than any other form of apparatus. Here is the story of the flight of one balloon. It was liberated by Dr. Schmauss of Munich on May 7, 1909, and immediately started up at a great pace. In the brief interval of thirty-one minutes, nine seconds it reached a height of eighty-nine thousand feet, or nearly seventeen miles above the earth. Here the rubber envelope could stand no further distension;



GETTING ALTITUDE WITH THE THEODOLITE



HOW THE CURRENTS OF THE UPPER AIR ARE TESTED

To the sounding balloon the meteorologist (specialist in the science of the atmosphere) attaches a basket in which his instruments are packed. In the illustration we see the meteorograph making its record of temperature, height, humidity, and wind velocity. These balloons have gone as high as twenty-three miles into the air and then burst, dropping their precious cargo to be picked up wherever it landed, and returned to the station from which it was sent up.

it collapsed, and in two hours, seventeen and a half minutes from the start, the meteorograph came to earth, undamaged, at a spot eighty-two miles south of Munich. Upon examination of the register, some remarkable facts were disclosed. At the start there was a light easterly breeze and the temperature of the air was forty-four degrees above zero, Fahrenheit. On reaching an elevation of four and a half miles, the balloon ran into a northerly hurricane of terrific violence, the wind for a time tearing along at a velocity of one hundred and twenty miles an hour. The wind was still maintaining the strength of a hurricane when the temperature went down to seventy-four degrees below zero at an altitude of seven and three fourths miles, a drop of one hundred and eighteen degrees from the start. Above this level the temperature rose as much as twenty-three degrees, so that when the altitude of seventeen miles was reached, the temperature was only fifty-one degrees below zero. At this tremendous height there was very little atmosphere left. The barometer reading had steadily dropped until it registered the hitherto unrecorded level of half an inch. In other words, it indicated that the pressure of air had been reduced from fifteen pounds to only a quarter of a pound to the square inch, or one sixtieth of what it is at sea level!

The record flight was made by a balloon that was sent up from the Observatory of Pavia, Italy, in January, 1913. The meteorograph attached to this balloon showed a height of nearly twenty-three and a half miles, and its thermometer registered a temperature of fifty-six degrees below zero, Centigrade.

WORLD-WIDE INVESTIGATIONS

With instruments of this sort men of science are making a systematic survey of the atmosphere all over the globe. The work is supervised by an international committee, with headquarters at Strassburg, Germany. Regular atmospheric soundings are made in this country by the United States Weather Bureau and by the Blue Hill Observatory near Boston. There are stations in Egypt, India, Java, Samoa, Argentina, Uruguay, the Canary Islands, and Spitsbergen. These international ascents are made on the first Thursday of each month, on three successive days three times a year, and once a year balloons are sent up on each day for a week.

Every expedition for scientific exploration carries apparatus for studying the upper atmosphere, and there have been many expeditions on the seas for this sole purpose.

Some day the currents of the upper air may be charted as accurately and as scientifically as the great ocean routes are at present. The transcontinental and transatlantic aviator of the future will then take advantage of the results of the years of patient investigation by many men in many lands.

WHAT MAKES AN AIR HOLE?

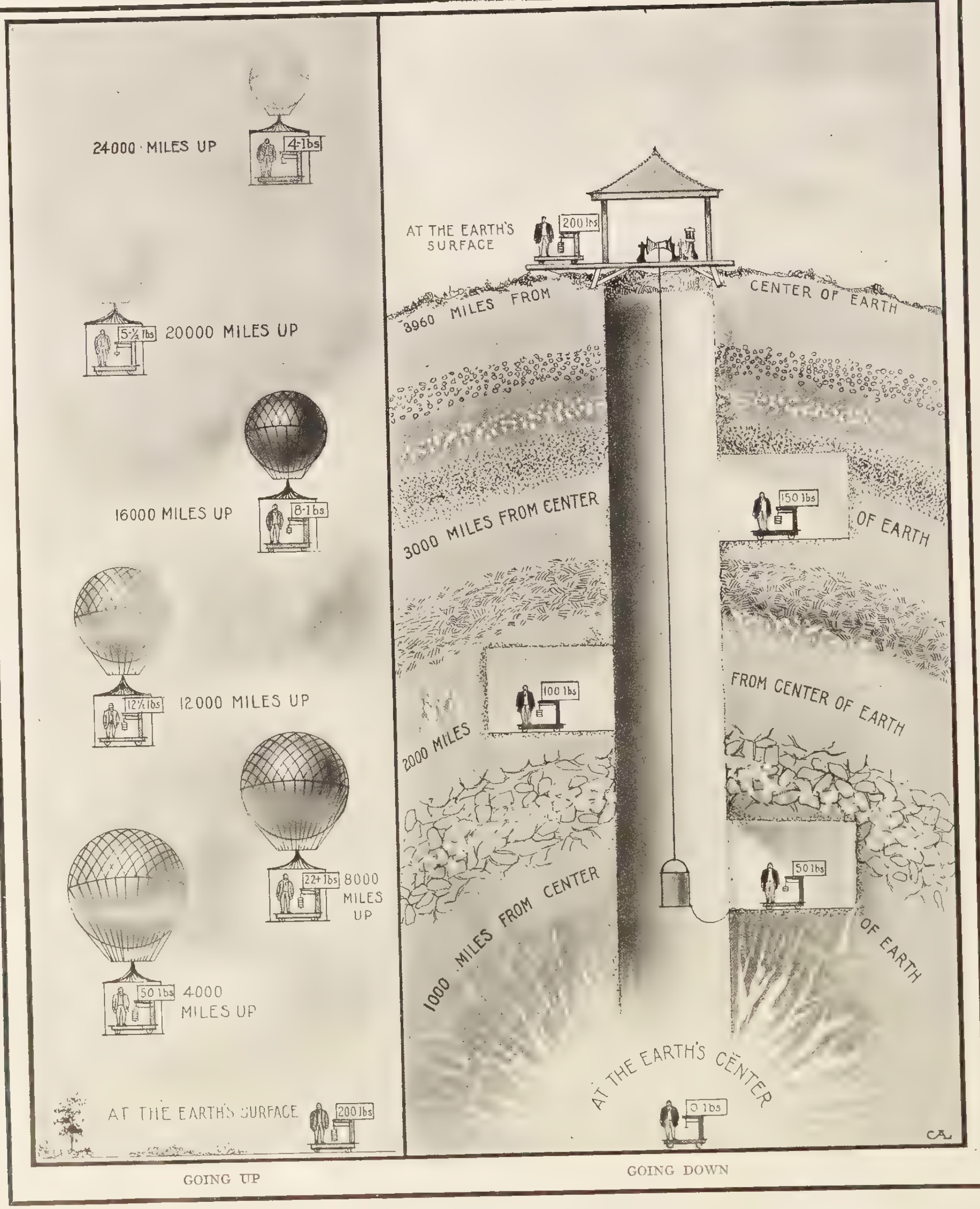
If you look down into a washbowl in which water is swirling around, you will notice that at the center of the whirl there is a hole in the water, caused by the centrifugal force of the whirl which is carrying the water away from the center toward the outer edge. Similar holes are formed in the center of air whirls, and are a great source of danger to the aviator. Their size depends on the velocity of the wind. The swifter the wind, the wider and deeper the holes.

In a small dust whirl, such as you may notice on a blustery day at a street corner where two winds meet, they will be a foot or so wide. In a tornado, where the wind is blowing with a velocity of from four to five hundred miles an hour, the hole may be a thousand feet wide.

HOW CAN YOU SEE THE WIND?

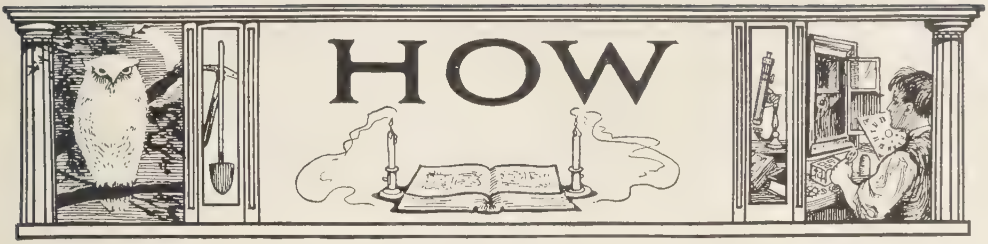
You have probably noticed the quivering air rising from a hot stove or a steam radiator or even from the road on a very hot day. You were seeing the air then. If you want to see the wind, take an ordinary saw and hold it with the toothed edge upward and across the wind. Then squint along the edge of the saw, and you will see the same quivering effect that is mentioned above; this is the wind passing over the saw edge.

WHERE WEIGHT CEASES



THE SAME SIZE, BUT AS LIGHT AS A FEATHER

It is easy to say that weight depends wholly on the law of gravitation, upon the pull of the earth. But it takes an imaginative sketch like this to make us realize it. This man weighs two hundred pounds at the earth's surface. Suppose he starts to take the four-thousand-mile journey to the center of the earth. As he gets down there will be less and less earth to pull him. He might well lose fifty pounds every thousand miles, till at the bottom he weighed nothing. Let him start up in a balloon. Here the whole earth would be pulling him back. Probably his weight would follow Newton's law. If he weighed 200 pounds at the earth's surface, at twice that distance from the earth's center, he would weigh one-fourth, fifty pounds, at three times that distance, one-ninth, and so on.



HOW COLD AND HOW HOT DOES IT GET?

THE temperature of the air — that is, the reading of the thermometer when placed in the shade — varies not only from hour to hour but also from month to month. The least variation is found on the oceans in the tropics; the greatest is observed at the interior of a continent.

The lowest temperature yet observed near the ground was at Werchojansk, Siberia, where the cold reached a temperature of 90 degrees Fahrenheit below zero in winter. In the same place it has also become as warm as 86 degrees Fahrenheit in summer. This makes a change of 176 degrees Fahrenheit during the year. As a contrast to this wide range is the climate of the island of Madeira, where the change between the highest and lowest temperatures amounted to only 11 degrees Fahrenheit during a year.

In the United States the lowest temperature yet observed was 63 degrees Fahrenheit below zero in Montana. On Mt. Washington the thermometer has read 50 degrees below zero; on Pike's Peak, 40 degrees below zero. In the desert region of southeastern California and southwestern Arizona, one of the hottest regions on the earth, the highest temperatures are about 122 degrees Fahrenheit in the shade. In western Dakota the total change in the air temperature during the year amounts to almost as much as that noted above in Siberia, the range being 170 degrees in some places.

HOW IS AIR MADE LIQUID?

It is hard to believe that the air which we breathe can be changed into a liquid, and yet liquid air is in frequent use in chemical laboratories. We are familiar with the idea of changing water to a solid by cooling it or to a vapor by heating it. All matter is in a solid, liquid, or gaseous state according to temperature and pressure, and substances differ widely in the degree of heat or cold required to change them from one to the other. Air is a mixture of gases and may therefore be liquefied, but it must be cooled to 216 degrees Fahrenheit below zero. Thus while water to become a gas must be heated to 212 degrees Fahrenheit above zero, air must be cooled to a temperature even farther below zero. To do this, use is made of the fact that when a gas expands rapidly it loses heat. The air is compressed to a very high pressure and then allowed suddenly to expand, thus cooling it. Doing this once would not reduce the temperature sufficiently, but by letting the cooled air on its way out from the vessel pass over the pipe through which more air is entering, the incoming air will be cooled to a point where, when it in its turn expands, about five per cent of it will liquefy.

HOW CAN AIR BOIL?

In the problem of storing this liquid air we come across another of its astonishing properties. Its boiling point is 310 degrees Fahrenheit below zero. Even with the slight amount of heat that will reach it in a double-walled flask made on the principle of a thermos bottle with a vacuum between the walls, it will promptly begin to "boil." So fast will it boil — away down two hundred and more degrees below our freezing point of water — that, if an outlet were not left for the escape of the gases given off in boiling, it would blow the vessel to pieces. Even with the utmost care, all of the liquid air in the vessel will boil away in a few days.

HOW DO WE HAPPEN TO HAVE DIFFERENT CLIMATES IN DIFFERENT COUNTRIES?

See Volume I, page 90.

WHAT WERE THE SEVEN WONDERS OF THE ANCIENT WORLD?

THE Greeks were the first to make a list of the most wonderful achievements which man had accomplished, and it is their list, begun probably in the time of Alexander the Great and completed before the first century B. C., which has stood for all time. To the classic world these were wonders because man had been able to make them; to the modern world they are no less wonders, not only because man could make them but also because he could make them without the aid of the tools and machines which are at the service of the builders of the twentieth century.

What were these seven wonders, and for what purposes were they built? The Pyramids of Egypt stand first, the oldest buildings in the world which have kept their architectural perfection, old in the days of Herodotus, the "father of history," who tells us that the Great Pyramid was built by Cheops, and that it took one hundred thousand men ten years to make a causeway three thousand feet long to carry the stone from the quarries, and the same number of men twenty years more to complete the pyramid. Built probably as the tombs of kings, they stand on the edge of the desert, the wonder of the modern world as well as of the ancient.

The Hanging Gardens of Babylon were built by Nebuchadnezzar for his wife Amytis. (See also Volume IV, page 190.) They were four great terraces, each one hundred feet wide, with arches and tunnels, through which water could be pumped up from the river Euphrates to keep flowers, trees, and shrubs growing until the pile of stone looked like a green mountain in the midst of the sandy plains of Babylon.

The Temple of Diana at Ephesus was first built in the seventh century B. C. In 356 B. C. an Ephesian youth, Herostratus, conceived the idea that he should like to do something so that his name should not be forgotten. He accordingly set fire to this wonderful temple, which burned to the ground in a single night, to be replaced by a more marvelous one built by the indignant Ephesians, who forbade that the name of Herostratus should be spoken on penalty of death.

The Colossus of Rhodes was a bronze figure standing at the mouth of the harbor of the city of Rhodes. Erected in honor of Apollo, it was to the harbor of Rhodes what our Statue of Liberty is to New York harbor, being as a matter of fact about a third smaller. Our medieval artist has followed a tradition of the time in having the boats pass between the legs.

The Zeus of the famous Greek sculptor Phidias was a statue of pure gold and ivory, forty feet high, in the Temple of Zeus at Olympia. Although the figure was seated, it occupied the entire height of the building. With its precious jewels, gilded draperies, chair of glistening ivory, and rich ornaments, it made a wonderful effect.

The Pharos of Alexandria was perhaps the greatest wonder of all from our modern point of view. To Ptolemy Soter, king of Egypt in the days following the reign of Alexander the Great, came the thought of erecting a huge lighthouse which should guide ships in the Mediterranean. This marble structure, said to be four hundred feet high, was built on the little island of Pharos. In the open space at the top great fires of wood burned, giving light to mariners for at least sixteen hundred years.

Mausolus, king of Caria, planned to erect a magnificent monument to himself and his wife Artemisia. He died before it was half done, and the work was carried on by Artemisia and completed after her death. It was a structure of exquisite beauty, and to this day monumental tombs are often called "mausoleums." (For the seven wonders of the modern world, see page 272.)

THE SEVEN WONDERS OF THE ANCIENT WORLD

AS IMAGINED AND DRAWN BY A SEVENTEENTH-CENTURY ARTIST

From top to bottom and left to right: The Pyramids; the Hanging Gardens of Babylon; the Temple of Diana at Ephesus; the Colossus of Rhodes; the Zeus of Phidias at Olympia; the Pharos of Alexandria; the Tomb of Mausolus at Halicarnassus.

WHY DOES A MASON WET BUILDING STONES OR BRICKS BEFORE LAYING THEM?

BECAUSE dry bricks and most kinds of dry stones absorb water rapidly, and would absorb the water from the mortar and weaken it.

WHY DOES A DOG TURN AROUND TWO OR THREE TIMES BEFORE LYING DOWN?

Scientists tell us that the ancestors of the dog lived in the tall grass and used to turn around in it many times to make themselves smooth, comfortable beds. Our dogs inherit the habit of these ancestors, even though they do not need to make their beds in this way.

WHY DOES BOILING WATER STAY AT THE SAME TEMPERATURE INSTEAD OF BECOMING HOTTER?

After the boiling point is reached, all the heat is used in changing the water into steam. More than five hundred times as much heat would be required to change a given quantity of water into steam as to warm it one degree Centigrade.

WHY DO ASHES, SPREAD OVER A FIRE, HELP KEEP IT?

Ashes are porous, and when spread over a fire allow air to reach the live coals in a quantity sufficient to keep up a very slow combustion, thus prolonging the life of the fire.

WHY DO SOME BULBS BLOOM IN WATER WITHOUT EARTH?

Some bulbs, like the narcissus, are very large in proportion to their plants, and are stored with much food material. When the bulb is put in water, and thus provided with the necessary moisture, it contains enough nourishment to produce leaves and blossoms without soil.

WHY CAN WE DRINK LIQUIDS THROUGH A STRAW?

It is one of the truths of science that "Nature abhors a vacuum." When a vacuum is artificially created, all surrounding matter tends to rush in and fill it. When you suck on one end of a straw, the other end of which stands in a liquid, you draw out the air, and the liquid which is at the other end rushes in to fill the empty space.

WHY DOES A CAT ALWAYS FALL ON ITS FEET?

The cat is a climbing animal and as such has acquired the instinct of adjusting its motions so as to fall on its feet. It is by its quick, lithe motions that it is able to accomplish this truly athletic feat. It is a mistake to suppose that a cat can fall from a very great height without injury. Cats have been dropped from balloons and, of course, were killed by the cruel experiment. No animal has more fear of falling from a great height than a cat.

WHY DO WEEDS THRIVE BETTER THAN CULTIVATED PLANTS?

Weeds are plants which have had to shift for themselves, without any aid from man, for many centuries in Europe and Asia; and only those which were well able to take care of themselves have survived. Cultivated plants have always been taken care of by man, and are therefore much less hardy.

WHY ARE DESERT PLANTS SO APT TO BE THORNY?

Probably to protect themselves from animals. Plants are so rare in the desert that they would all soon be eaten up if the animals could get at them.

WHEN WAS THE DEGREE OF M. D. FIRST CONFERRED?

THE first record we have of the bestowal of the degree of M. D. is when in 1329 Wilhelm Gordenio received the two degrees of Doctor of Arts and Doctor of Medicine at the College of Asti, Italy. Not long after this date the University of Paris began conferring the degree "Doctor of Medicine," and from that time the term has been adopted in all our universities.

WHEN WAS THE MAGNETIC COMPASS FIRST KNOWN IN EUROPE?

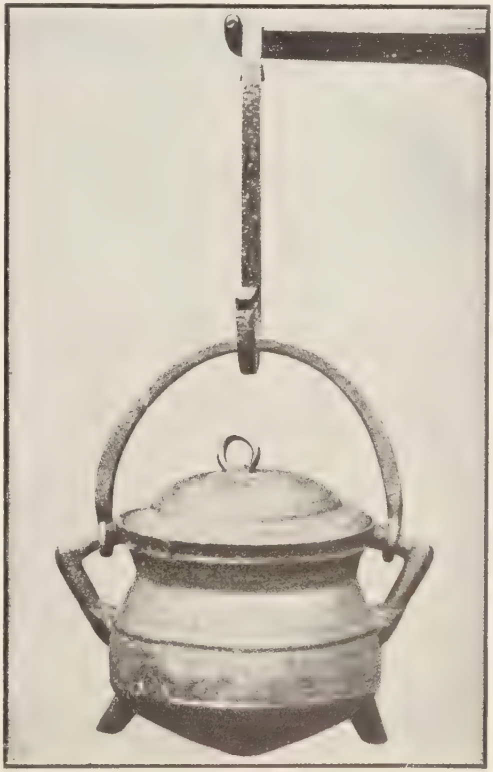
During the twelfth century it was brought to Europe by Crusaders, who had obtained it from Arabian traders in Eastern waters. When first brought to England, none dared to use it, lest they should be accused of witchcraft. It was also thought that sailors would not go in a ship whose captain had an instrument which, from its strange and wonderful qualities, might possibly be the work of evil spirits. The compass came into general use late in the thirteenth century. (See in Volume II, page 5, the story of the era which was ushered in by the mariner's compass.)

WHEN WAS THE FIRST AMERICAN WEDDING?

In 1609, at the settlement of Jamestown, Va., the first marriage according to English rites was performed. The bride was Anne Burras and the bridegroom John Leyden, who had come from England to help colonize the new land.

WHERE DID WE GET THE CUSTOM OF SHAKING HANDS?

In the age of chivalry, when men carried swords or daggers, always ready for attack or defense, if a man wished to show that his intentions were peaceable he extended his right hand, indicating that he placed himself at the mercy of the other by giving up his fighting arm. If the other were also peaceably inclined, he put out his right hand, and then came the handclasp in token of friendship.



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WHEN WAS THE FIRST METAL CASTING DONE IN AMERICA?

In 1642, at the Saugus Iron Works, this kettle was made. It is now in the possession of the city of Lynn, Mass., to which it was presented by John Hudson, a descendant of Thomas Hudson, owner of the site of the iron works, to whom this first casting was given when it was made.

WHO IS LUTHER BURBANK?

FEW Americans have made in a lifetime a contribution of such immediate and practical benefit to mankind as Luther Burbank, plant breeder and plant originator of California. He was known nationally and internationally for the production in his nurseries of new and improved fruits, flowers, vegetables, grains, and grasses.

Luther Burbank was born in Lancaster, Mass., in 1849, and died in 1926. As a youth he was interested in market gardening and seed raising and produced the Burbank potato, which is a standard variety still in use. In 1875 he went to Santa Rosa, California, where he has since carried on his work. His first years, like those of many another great man, were hampered by ill-health and made difficult through lack of adequate financial backing. He had to depend wholly on himself. Yet even in the early period of extreme hardship, when he was building up the nursery which was to be his business, he held in his thought and in his study to the subject of plant breeding.

International Newsreel Photo

LUTHER BURBANK

A snapshot of the well-known plant originator, taken in his garden as he holds a specimen of his remarkable spineless cactus.

The aim of such work is threefold, — to improve old varieties of plants by uniting them with others whose characteristics it would be desirable for them to acquire, to merge wild types of plant life with cultivated ones, so that they may be of greater service, and to create new forms of life. Such work involves experimentation with thousands upon thousands of seedlings. He worked eighteen years to produce from a wild grass, — the ancestor of Indian corn, — which would grow only in Florida, a variety of corn which is a productive fodder plant and will grow all over the United States. He took the prickly cactus of the arid regions, which was useless from the point of view of man or beast, and worked over it patiently year by year, until now he has a whole series of giant spineless cactus plants, of which the one he is here holding in his arms is an example. He has taken fruits with stones and made them stoneless, poisonous fruits and made them harmless.

If genius be "an endless capacity for taking pains," Burbank measured in this as in other ways to this definition. To the outsider his work looked like a succession of miracles; to him it seemed the natural result of forty or fifty years of hard, painstaking, intelligent effort. A true estimate would doubtless lie halfway between the two aspects. His love for and knowledge of plants amounted to sheer genius. He read the secrets of Nature as few men in any generation have been able to read them.

STUDENTS CONSTRUCTING A VOCATIONAL SCHOOL BUILDING

RIP VAN WINKLE AND A SCHOOL OF TO-DAY

[We are indebted to William H. Timbie and Arthur L. Williston, both long associated with the introduction of practical mechanics into a well-ordered school curriculum, for the following article describing the methods in progressive technical schools and setting forth the advantages derived from this latest development of modern education. The pictures are of Wentworth Institute, Pratt Institute, Brooklyn, N. Y., and Williamson School, Williamson, Penn. In "Rip Van Winkle and a School of To-day" conditions in endowed technical schools are described; in the succeeding article, "Education for Life Work," Dr. David Snedden, formerly Commissioner of Education for Massachusetts, discusses vocational tendencies in general education and in the public school.]

IN an idle hour, did you ever try to imagine just what a modern Rip Van Winkle would think if he were suddenly awakened to-day, after having been asleep for perhaps fifty years? How astonished he would be to find himself in the midst of the complicated life of this twentieth century! How many surprises would be in store for him!

To be sure, he would be familiar with steamboats, for the first steamboat was built more than fifty years ago. He would be familiar with locomotives too, and with the telegraph and with the daily newspaper; but what do you suppose he would think about modern ocean liners that cross the Atlantic in four days; of the modern Pullman trains with all their luxuries; of our electric street cars and automobiles, moving without any visible power to propel them; or of the phonograph and the telephone, which reproduce the human voice so perfectly that we actually feel the presence of the persons talking? Again, what would be his sensations when he first was shown our colored motion pictures, wireless telegraphy, or aëroplanes? Surely he would think that he had awakened in a land of mystery where marvelous dreams come true.

Yet, great as his surprise would be at all these wonders that we are fast becoming familiar with, it would probably be no greater than his astonishment on visiting a really modern school.

THE LITTLE RED SCHOOLHOUSE

The school that our Rip Van Winkle knew when he was a boy was "The Little Red Schoolhouse" where he had

> "Reading and writing and 'rithmetic,
> Learned at the end of a hickory stick,"

and a few subjects of the same sort, that have helped to make schoolbooks distasteful to so many boys. All the boys were treated just alike. All the boys were taught in the same way.

It is n't necessary to describe the schoolroom, or to tell how impatiently he and his comrades watched the clock for the noon recess, and listened for the bell that gave them permission to go home. The school of his time was one that appealed to a *few* boys. But for so many, many others it proved only a dreary discipline, train-

ing merely the memory which was crammed with dry facts, when their real interest was far away in their fishing and their skating, in their animal pets at home, in the crops they hoped to grow, and in the things they planned to do — for in Rip Van Winkle's time the real interest of boys was *in doing.*

But how different in the modern school! For some of the greatest discoveries of the twentieth century have been in school teaching.

ONE GREAT DISCOVERY

The first discovery was that there are many different kinds of boys and girls. When Rip Van Winkle was a boy and went to school, his teacher used to think that all the children had just the same kind of minds and that what was good for one of them was good for all. So he gave everybody the same lessons and asked everybody the same questions. But in the modern school that our Rip Van Winkle has learned about since he was awakened, this is all different. He finds that the teachers here know all about the differences in children. They expect some children to have good memories and some to have poor ones: that some can do very hard examples in their heads and that others cannot do such examples at all. They appreciate that some have an ear for music and that others cannot tell one note from another; that some can do things very well indeed with their hands and that others are very clumsy; that some are good in writing compositions and know the right meanings of a great many words; that others are good with their lead pencil and are very accurate in figures; and that others have very good eyes and can see all the interesting things that are happening about them in Nature. The teachers expect to discover these differences in their pupils and know how to give just the right kind of lessons, with books or without books, to help each one in the things that he is weak in, and to show him how really to excel in the kind of things for which he has some special ability.

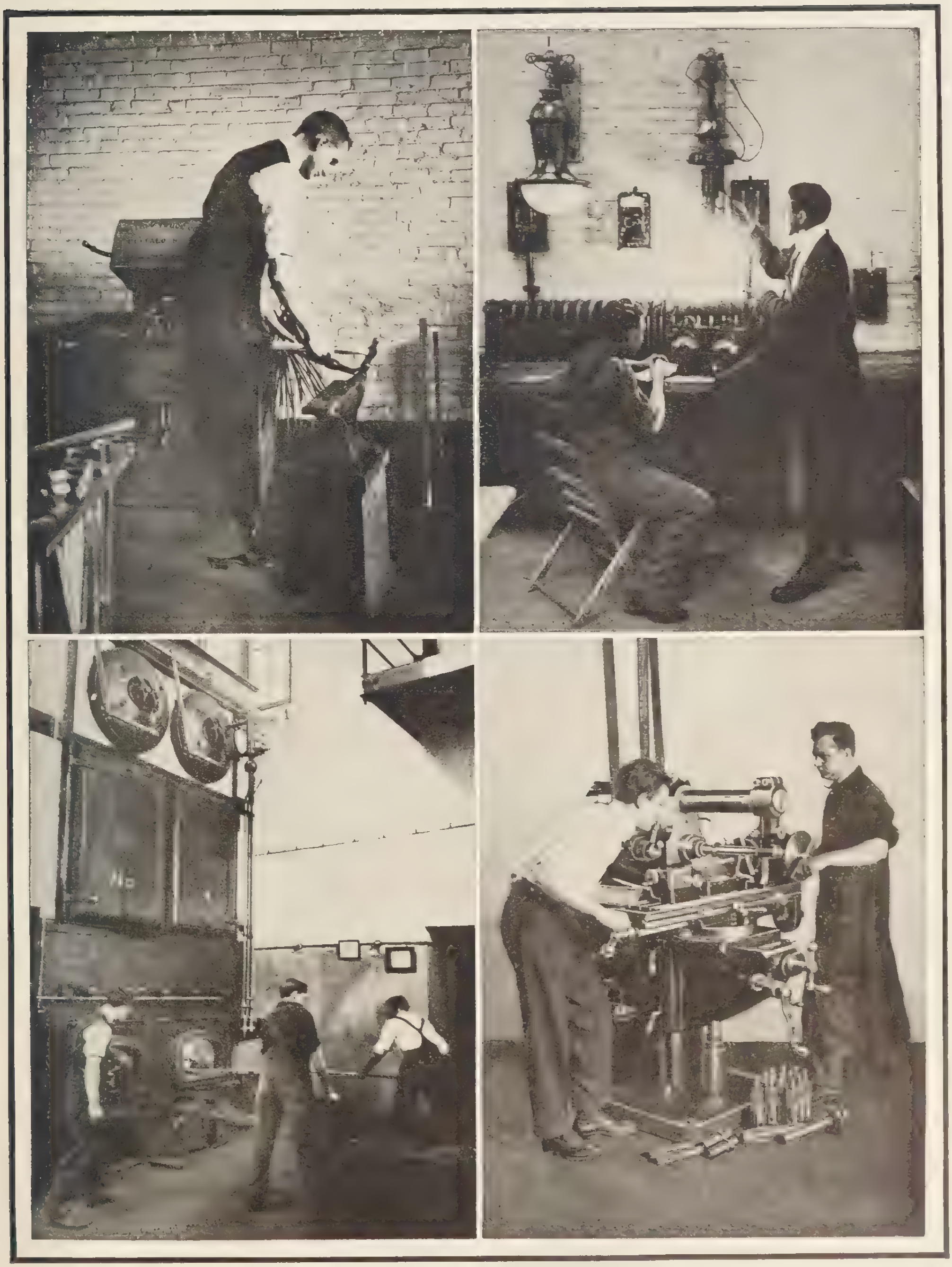
Can you imagine just what this means to some unfortunate boy who perhaps cannot do some of the things that his comrades can? Maybe he cannot spell; or maybe he cannot do algebra examples as fast as the rest; so he is always at the foot of the class, always held up to ridicule, and always ashamed. Think what it may mean to such a boy to have a teacher who really understands his difficulties; a teacher who also knows how to find out the one thing that he can do better than all the rest, and who is wise enough to give him during part of the time opportunity to do that thing, so that he may have his turn at being at the head of the class and *showing his comrades how!* For the most wonderful thing in these new discoveries regarding boys is that the boy who is very stupid in one thing almost always has some particular ability in some other direction which we can bring out if we know how.

As we become familiar with the new discoveries about the mind, they seem so natural that we forget how wonderful they really are. It takes something out of the ordinary to make us appreciate what marvelous things have been accomplished. We have taught the deaf to hear by using their eyes instead of their ears; we have taught the dumb how to speak; the blind have been given eyes at their finger tips and they can now read; and boys whom everybody thought stupid have been shown how to lead their classes. Are not these things as wonderful as ocean liners and Pullman cars and flying machines?

ANOTHER GREAT DISCOVERY

The second great discovery that Rip Van Winkle found had been made during the time that he had been asleep is that there are just as many different kinds of education as there are different kinds of boys.

In the little red schoolhouse to which he went there were only a few books and only a few kinds of things to learn. These were all just the same sort of things that his father and grandfather had learned before him. But to-day not only are there spelling and arithmetic and Latin and Greek and the story of what men did and said who have been dead a thousand years, but everything in the great wonderful world of Nature and of business and of industry has come into the schoolroom. All the new sciences and all their useful applications that make life more comfortable and more enjoyable have been added to the list of things that we can teach



PRACTICAL INSTRUCTION IN MECHANICS

Top (left): The smith at his anvil. Top (right): Testing an arc lamp. Bottom (left): A lesson in boiler firing. Bottom (right): Working out a problem in the machinery department.

since our Rip Van Winkle went to sleep. To-day boys can learn in school about all the interesting things of Nature, about the flowers in the field and what makes the grass grow; about the birds and the fishes and the livestock on the farm; about the new varieties of fruit and vegetables that one can grow when one knows how; about electricity, locomotives, and automobiles; and about a thousand things mechanical that are fascinating to certain kinds of boys.

Do you wonder that Rip Van Winkle was astounded when he found how much more there is to teach to-day than there used to be when he was a boy and went to school?

A THIRD DISCOVERY

But the third discovery surprised him most. He supposed, as everybody used to, that education meant just training the mind, just getting ability to remember things and learning how to think in the way in which you have to when you solve a difficult example in mathematics. He discovered, when he visited the modern school, that the teachers regarded these as a very small part of education and were surprised when he reminded them of the old-fashioned notions. They told him that it was just as easy to educate the heart as the head, and that they took more pleasure in producing a fine, big-hearted, noble boy than a bright boy in the old-fashioned sense. They told him that it was just as easy to develop ambition as it was to cultivate the memory, and that it often was easier to develop executive ability, which men so highly prize, than it was to teach a boy how to spell. They told him that their idea was to send the whole boy to school — his mind, his body, his hopes, his dreams, his ambition, his sympathy, his love of sport and play, his love of work well done; and they could not understand how teachers should ever have been willing to keep all these things locked outside the schoolroom — excepting just the intellect.

THE MODERN METHODS

Rip was immensely interested in their description of the new work and asked what kind of lectures they gave and what kind of books they used. They told him that lectures were of no use to them whatever; that books were of just as much value in the modern school as they ever had been, and showed him better books for teaching science and history and literature than he had ever seen. They said, however, that for only part of their work were they able to use books, and that for more than half of it no books at all were required; and they told him that the greatest discovery of the modern school was that one could learn more by *doing* than he could possibly learn from books.

They told him that the president of a great university had once said, "I hope to see the day when my university will offer more courses in doing than it offers in things that can be learned from books alone." "Already this is being accomplished in the modern school," they said. And they told him that, in their opinion, the finest books of all had been written by men who had gathered the wisdom in their books from life rather than from reading.

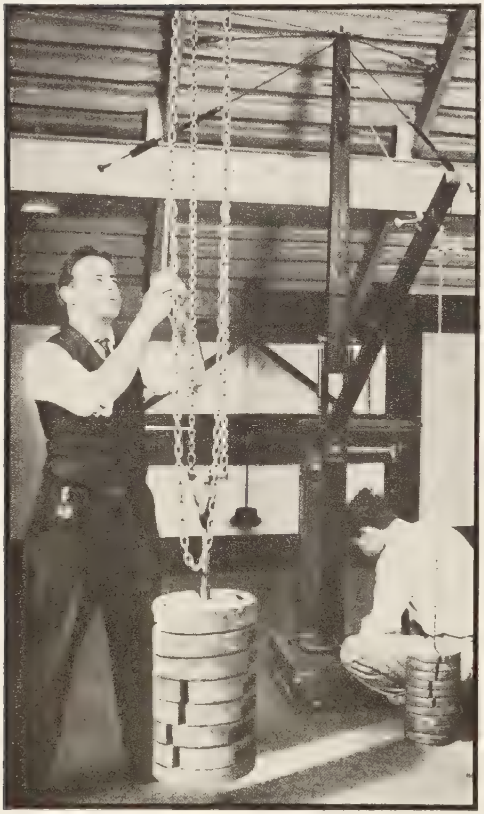
Rip Van Winkle was very much impressed by all that was told him about the new methods of teaching, but the results described seemed so wonderful that he wanted to see the work with his own eyes.

A TOUR OF INSPECTION

So the teachers took him about through a great many departments of their school, one after another, where they were educating boys and girls of every age. First they took him into a very large, beautifully lighted room full of benches and machinery and piles of lumber where boys were at work on various parts of a full-sized house. Some were putting on the clapboards; others were shingling the roof; two boys were laying out the rafters and finding at exactly what angle to cut them so as to make a perfect joint; a group of others was working on the staircase and fitting the balustrade, which made a graceful curve as the stairs ascended; another group was laying a parquetry floor, and still another was finishing a beautiful mantelpiece for the dining room and fitting it to the hardwood wainscoting which had just been completed. Every boy in the room was busy at something. They were planning, laying out, cutting and fitting, and everyone was intent upon his work and most enthusiastic over it.

TOP: A CLASS IN CARPENTRY AND BUILDING. BOTTOM: THE PLANING MILL

Boys in the modern vocational school learn every detail of house building.



TESTING CRANES

It was evident that all were determined that the finished result should be something that everyone could be proud of. Everywhere there was evidence of energy, coöperation, and appreciation of responsibility such as had never been seen connected with any school before, excepting perhaps at exciting moments during a football contest. But this work, the teacher said, was going on in just the same spirit hour after hour every school day of the year.

Next Rip Van Winkle was taken into a second room, where he found a portion of this same class, not making things, but again *doing* things. They had weights and pulleys and spring balances and platform scales for weighing loads, and all sorts of other apparatus for measuring forces. There was every kind of a crane one could imagine, and the boys were loading them and finding out how they worked and what loads they could safely carry; for these boys in their work on buildings have to hoist heavy materials and must learn how to do it with perfect safety.

From this room the teachers passed on to a third, where they found another section of the same class, again not with books but in action and *doing* things. Some were at their drawing boards with lead pencil and T square; others had their rules and sketch pads and were measuring various details of house finish. The teacher said that this section was preparing plans for some of the things which they were going to build in the shop the following week.

In the next room was another section of the class in carpentry and building — for they were still in the same department. Here they found the boys sitting in groups around tables with notebooks, scales, and piles of blue prints spread out before them. They were learning to read plans and were estimating the exact cost, both for labor and for material, of the building on which they had been working.

THE WHOLE BOY SENT TO SCHOOL

Rip Van Winkle was beginning to understand, as he saw all the different kinds of activities which were being carried on in this one department, what the teachers meant when they told

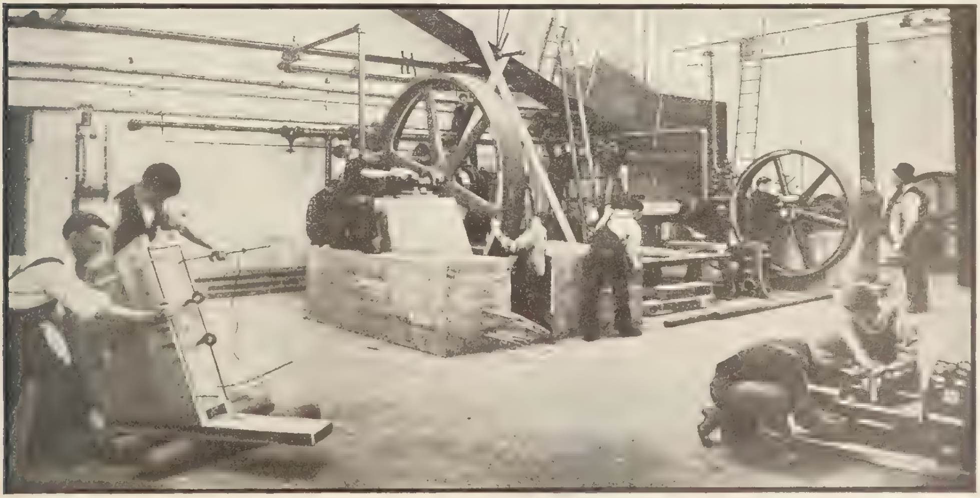
MAKING MOLDS FOR A LARGE MACHINE

A CLASS OF BUILDERS AT WORK

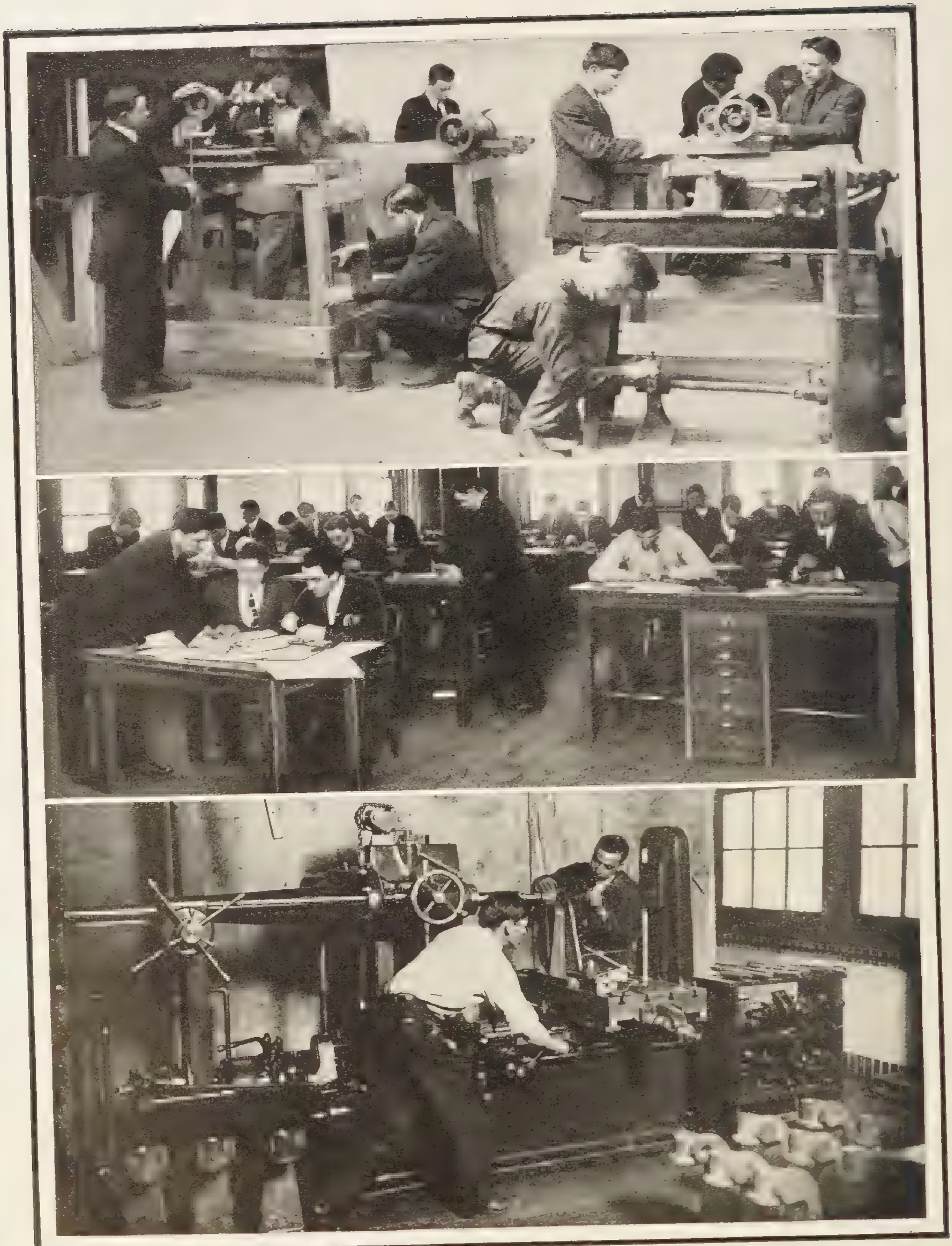
him that in the modern school not the intellect alone but the whole boy was sent to school. Thus far he had not seen any textbooks, and he asked if they were never used. "Yes," the teacher said, "we use some books with every class. We wish the pupils to be familiar with books and to value them. Some of the principles of science, some of the technical methods in the trade, some things about the estimating and computation work, we can teach more rapidly with books than in any other way."

THE MACHINE DEPARTMENT

The second department visited was the machine department. Here was a splendid large room filled with a great quantity of the most modern machine tools. The variety of tasks was as great as in the previous department, and the boys were just as intent upon their work. They were manufacturing, in considerable quantities, complicated machinery. They had just finished two milling machines, which had



INSTALLING A STEAM ENGINE



IN THE LABORATORIES OF PRACTICAL MECHANICS

Top: Studying machines. Middle: Solving problems of carpentry on the drawing board. Bottom: Making parts of machines.

IN THE LABORATORIES OF PRACTICAL MECHANICS

Top: Laying out electric wiring. Bottom: Making machines for market.

A MODEL CHEMICAL FACTORY

The manufactured products of this department include toilet and laundry soap, dyes and pigments, ready-mixed paints and varnishes, all kinds of manufactured leather and hides, and a large variety of commercial chemicals. The sale of these yearly nets the school a large revenue.

been added to the equipment and were operating as perfectly as any machine in the shop, and were now at work upon a lot of two dozen large back-geared and power-feed drill presses that they expected to put on the market.

In the room adjoining, another group of the same class was measuring the friction and efficiency and studying the operation of all sorts of systems of gearing and methods of transmitting power. In the room beyond, another group was learning all about the different kinds of steel used in the shop. There were large, but very accurate and sensitive machines for this — machines that would weigh forces of many tens of thousands of pounds — and the boys were finding the strength of the different specimens, the elasticity of each, and whether or not each was the right kind of material to use for the particular jobs that they had to do.

This department was so interesting that Rip Van Winkle wished to linger, but the teachers hurried him on. There were many other departments for them to visit, and they could afford to spend but a few minutes in each.

FOUNDRY AND LABORATORIES

From the machine shop they went to the foundry, where boys were at work making brass, aluminum, and iron castings of every conceivable kind. Rip Van Winkle marveled at the size, the quality, and the perfect finish of the castings, and naturally asked the teachers how it happened that boys who had had little experience in such work could produce much better results than were usually obtained in even the best commercial foundries by experienced men.

The door opened and they were in the testing laboratories of this department, where every facility was at hand for accurately measuring everything that entered into either the making of the molds or the melting of the iron, and groups of boys were at work making chemical tests and physical tests in order to find out at every point what was the best way of doing each particular part of the work. "This explains," the teacher said, "the secret of our success. With such facilities for finding out how to do things and with the kind of ambition and interest that you have everywhere seen, can you wonder that we get remarkable results?"

And so they passed on through department after department, visiting classes in forging and electric wiring. What boy would not be fascinated by the opportunity to install a complete system of electric lights for a dwelling house, electric bells and telephone systems, a fire-alarm system, or a system for furnishing power? All these were taught.

GROUPS OF STUDENTS AT WORK

Top (left): Building switchboards for two motors. Top (right): Testing the strength and elasticity of steel. Middle (left): Removing castings from the molds. Middle (right): Student plumbers installing fixtures. Bottom (left): Making sand cores for the molds. Bottom (right): Making wooden patterns for the molds.

PRACTICAL MECHANICS

Next came the plumbing department, and it was a surprise and a delight to find that the flow of water in pipes and all the other things that a modern plumber needs to know could be made almost as interesting as the study of electricity.

In each one of these departments they saw sections of the different classes at work on drawings and design, and on estimating and computing costs, and in each it was apparent that all the different parts of the work were so related as to make a single united subject into which a boy could throw his whole heart. What a contrast to the separate, disjointed subjects familiar in the schools of yesterday!

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PRACTICAL METAL WORK

Other departments were inspected — sheet metal work, bricklaying, and printing. All the important occupations in the modern industries seemed to be included. They visited the department where steam power-plant practice was taught, and passed on through it to rooms that were filled with all sorts of electrical machinery and appliances. Much of this the boys had designed, constructed, and installed. Here Rip Van Winkle noticed something he had never seen before. Some of the boys seemed to be acting as foremen and directing the work of the others. These boys, he learned, were actually held responsible for the production as well as the mistakes of the boys who were assigned them as subordinates. The teachers told him that this foremanship instruction was one of the newest and most valuable details of the school. It gave appreciation of responsibility and taught boys both how to command and how to obey. It was one of the most useful means of developing leadership that had been discovered. The plan was in practice in every department. Each student in turn was a subordinate and then a foreman.

The time was getting short. There were so many departments that all could not be seen. An entire group of buildings was devoted to departments of business and commerce. The teachers explained that the same methods used in teaching all the industries were being adapted to training boys and girls for an equally great variety of occupations in business and trades, and hurriedly escorted their visitor through departments of advertising, salesmanship, window display, mail-order correspondence, expert accounting, and banking; but there were many other departments that had to be omitted.

THE HOME-MAKING DEPARTMENT

Rip Van Winkle left the commerce buildings and was led through a beautiful open court to another group of buildings over the entrance of which was inscribed "The Trade and Home-making Occupations for Girls and Women." The principal of this department escorted them through, and, as she did so, she explained what it would mean to every community if, in all the occupations that are now being opened to girls and young women, there could be the same kind of skill and excellence that we like to associate with the old-fashioned master artisan. In the different workrooms she showed them evidence that this idea was not an altogether impractical dream. So, too, she explained what it would mean in increase of comfort and happiness and

SCHOOL GARDENING AS A PREPARATION FOR HOME GARDENING

in better health and vigor of the people if the girls who are to be responsible for making the homes in the future were efficiently taught the essential arts and sciences upon which every well-directed home is founded.

FINE AND APPLIED ARTS, LITERATURE, AND ATHLETICS

Out of the windows across the campus rose on one side the buildings devoted to departments of fine and applied arts, and on the other side those devoted to science and literature; and beyond, stretching down to the bank of the river, were the gymnasium and the student clubhouses, the tennis courts and athletic fields; for it was explained that young people who devoted themselves to their work with the kind of intensity that had everywhere been noticed need a period for relaxation, companionship, and spontaneous play.

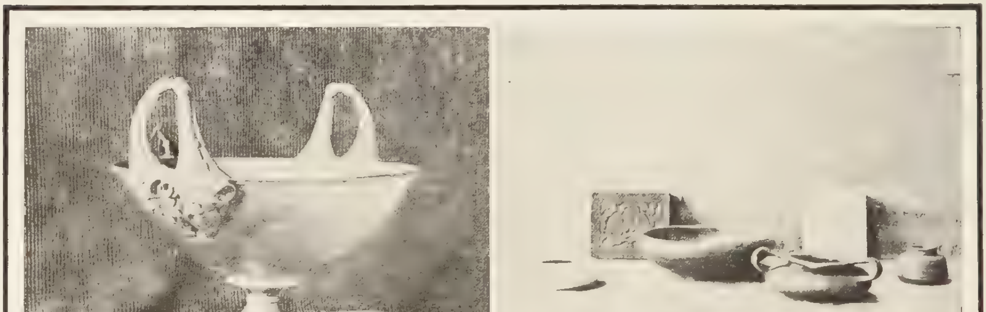
In the modern school everything seemed to be provided for. There was a place where every kind of a boy or girl could find something in which he or she could learn to excel. As Rip Van Winkle was about to depart, he thanked the teachers who had given him so much time and attention. He felt so impressed by what he had seen that he feared it might be a dream, an ideal to work for, but something not yet accomplished; so he asked the teachers where else in America he could find work similar to what they had shown him in the modern school, and what results had been accomplished.

He was told of whole cities that had been transformed into veritable flower gardens through the influence of school teaching; first through school gardening and then through the school-directed home gardening. He was told of towns in which the spirit of art had so permeated all of the people that the schools had become recognized art centers, where industries dependent

upon art appreciation and artistic skill had grown up and were flourishing in consequence. He was told of new varieties of vegetables and new kinds of fruit that were actually being grown for market. He was told of states in which the annual corn crop had been increased to the value of tens and tens of millions, and the human crop in intelligence and character increased still more through instruction given to children in the elementary schools in seed corn and in how to plant and cultivate.

Rip Van Winkle had heard enough. As he went away, he said: "Marvelous as are all the discoveries and inventions that have been made since I was a boy, this is the most marvelous of all. If it were necessary, we could do without the ocean liners and go back to sailing vessels, we could do without the Pullman trains and the automobiles and travel by horse-drawn vehicles, we could do without the wireless and the aëroplanes and be content to send our messages by wire and walk upon the earth; but having gotten the vision of what the modern school means in increased happiness to boys and girls and increased usefulness to men and women, we would never be content to go back to the old-fashioned kind."

Rip Van Winkle was right. The modern school is not found everywhere. All trains are not yet Pullman trains. There are still some old-fashioned locomotives and still some very shabby coaches; but modern equipment is steadily being adopted, and likewise modern schools are being multiplied. When Rip Van Winkle awakes again he will find one in every community.



SOME OF THE FINISHED PRODUCTS

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OUTSIDE ACTIVITIES CARRIED ON IN CONNECTION WITH CITY SCHOOLS

EDUCATION FOR LIFE WORK

EVERY effort should be made to devise ways of improving secondary education, and it is a hopeful sign that in so many of the states of the Union public opinion has become awakened to the necessity of such improvement. It may be said that vocational and industrial training has already gained a sure place in our public-school system. The experimental stage has not wholly passed, but the need is a recognized one, and that is a great gain. It is impracticable and undesirable to effect a "revolution" in the organization and administration of any form of education; but it is possible to study, with thoroughness and scientific method, the specific aims, methods, and results of education, and to devise experiments and readjustments which shall look to greater efficiency. Every educator can legitimately aid in forwarding developmental work of this character.

Of first importance is the establishment of clearer and more comprehensive conceptions as to the valid aims which shall control in the organization of courses of study and of the specific subjects composing them. The most important recent advance in this regard has been the general acceptance of the idea that education for vocation has a legitimate place in a complete plan for secondary education no less than education for culture and citizenship. The high school did not, as originally conceived, educate for vocation, unless in the sense that certain of the linguistic, mathematical, and scientific studies were believed to be fundamental to the professional studies later to be undertaken. The historic studies of the high

school have been generally conceived as making contributions to general culture and to mental training, the ends probably best covered by the phrase "liberal education."

VOCATIONAL TRAINING

The acceptance of the vocational aim in secondary education first appeared in connection with the commercial studies. Later, the public gave hearty support to the establishment of manual training, technical, and agricultural high schools, in the belief that these would train youths for specific occupations, or at least give essential training therefor. But genuine vocational aims have not controlled in these courses. The public, and especially parents, have desired that the instruction offered in these schools and courses should actually give vocational training; that is, that in a positive way it should fit boys and girls in part, at least, for the successful pursuit of the occupations suggested by the titles and the alleged purposes of the courses offered.

The important fact, however, is that the public is now entirely willing that the system of secondary education should include vocational schools and courses under public support, and be developed to any desirable or practicable degree for the purposes of vocational education. We are steadily moving toward the time when a complete system of secondary education will include a variety of schools, departments, or courses of study designed to give young people from fourteen to twenty years of age efficient vocational preparation for a large variety of useful callings.

EDUCATION FOR CITIZENSHIP

Another purpose or aim which is now receiving much attention is that of "social education," so called, which title comprehends various phases of moral education and training for citizenship. The period in the life of the average boy or girl usually devoted to secondary education — from fourteen to eighteen or nineteen years — offers opportunities for education in the ideals, habits, and knowledge that underlie good citizenship not equaled during any other four years of life. It is often asserted that the chief aim of high schools as now organized should be, or actually is, education for citizenship. But a careful examination of the programs and of the educational results of these schools will show that the alleged aim of training for citizenship is not clearly defined and has not been so analyzed as to indicate the procedure by means of which it is to be attained. The social life of the high school, as a miniature community, is intensely active, and good results may follow participation in it. But such results are only occasionally the outcome of conscious and prearranged efforts and coöperation on the part of teachers and other school authorities. The usual high-school course of instruction for most pupils includes English literature, some history, and a small amount of civics; but it can hardly be contended that these studies, as now taught, make important contributions to a vital education in the ethical, civic, and political principles which underlie moral character and good citizenship. The discipline of the school, combined with the personal influence of teachers and principal, may also be important and valuable factors in the development of civic habits and ideals; but the results thus obtained are, under present conditions, due more to accidental circumstances than to purposeful methods of meeting clearly defined ends.

OPPORTUNITY FOR CIVIC TRAINING

A splendid field for the development of ways and means of more efficient education lies ahead of the American secondary school as regards this broader civic education. In a vague and too often purposeless way some responsibility for it has long been accepted by the high school; but adherence to traditional procedures, coupled with incapacity to devise suitable educational ways and means, has long prevented or retarded the development of instruments and methods adapted to produce in the adolescent the moral habits, civic intelligence, and social ideals required as foundations of a high order of citizenship.

It is clearly possible, once having clearly defined and concrete aims, to devise suitable courses and methods of instruction, systems of training, and guidance of personal conduct

to achieve the ends here suggested. At the outset it must, however, be recognized that such a program will require essentially different means and methods of instruction from those that have long been customary in connection with the teaching of the older subjects.

HIGH-SCHOOL BOYS LEARNING TO BE SKILLED WORKMEN

THE PURSUIT OF CULTURE

Another of the valid purposes of secondary education, and one which is now alleged to control in high-school academic courses, is expressed by the comprehensive but vague and often mystical word "culture." Here exists another large opportunity for the constructive study of the aims and accomplishments of secondary education, provided we refuse to be content with vague generalizations and mystical inferences. Culture, as exhibited by the cultivated man, is certainly capable of being defined in terms of persistent interests, pervading sentiments, attractive habits, and inspiring ideals. To produce such realities as taste in literature, various forms of art appreciation, refined manners, noble character, fine sympathies, and other qualities approved "of good men," offers a field of educational achievement that is surely worth while. It is certainly possible to realize these results through the use of appropriate instruments and methods of an educational character. To this end it is necessary, of course, in connection with education, to distinguish between the acquisition of the knowledge, appreciation, and ideals that give rise to interests and accomplishments that are in themselves elements of culture, and those other studies or forms of training which give

mastery of the keys or instruments whereby access is gained to culture-giving agencies. Knowledge of good literature accompanied by sympathetic appreciation constitutes easily recognizable elements of personal culture; but the actual process of learning to read, which is for most people a necessary key to literature, is not necessarily culture-giving in and of itself. The study of Latin as a language is often confounded with the study of Roman literature, to which a knowledge of Latin as a language is a key. Latin, as ordinarily studied, indeed, by high-school pupils who do not pursue it farther in college, may be of questionable value in contributing to a genuine culture except, perhaps, as it leads to an incidental appreciation of the scope and character of one phase of historic civilization — a result that could probably be obtained much more expeditiously in other ways. But appreciative contact with the best of Roman, and especially of Greek, literature by those equipped to make such contact easily effective, certainly gives rise to intellectual and esthetic qualities that may legitimately be described as constituent elements of fine culture.

Few will dispute the assertion that the "culture" of the American citizen of the twentieth century should, in reasonable measure, include a broad and vital insight into the significance of science for contemporary life. Our civilization extends its roots deep into the soil of the past, but its branches and foliage take their shape and color from the achievements of modern scientific spirit and attainment. It may well be disputed, however, whether, in our programs of secondary education as now organized and administered, we actually draw upon or use in any effective way the materials that will produce genuine appreciation of the place and significance of science in modern life. Certainly our formalized courses in physics and chemistry, as now taught, rarely lead to such a result. The cause of our failure is, of course, to be found chiefly in uncertainty as to the real aims which should control in the teaching of science. It is clearly possible for existing high schools to introduce courses designed primarily to give breadth of vision and abiding interest in science and its applications. Courses for this purpose must deal largely with the concrete realities of the contemporary and environing life, and they must not greatly emphasize abstract formulæ, generalizations, and principles. Such courses must not be restricted to one or a few of the so-called sciences, as these have been separately organized for purposes of study by specialists. Their organization must be determined largely by the demonstrable interests and capacities of growing boys and girls, as these react on the vital and suggestive features of their environment. They should serve both as a means of giving general information and experience of a realistic nature, and also of viewing and interpreting these results in a scientific spirit — but a kind of scientific spirit not produced by current high-school science teaching.

NEED OF INVESTIGATION

It is clear, therefore, that vocational education and social education, as well as some phases of education for personal culture, establish aims that must be realized largely by means of subject matter and methods of instruction unlike those heretofore found in academic and "practical arts" courses in high schools. But in connection with the regular and established subjects are also found no less promising opportunities for constructive work in making secondary education more vital. It is urgently necessary to define more concretely the aims of these subjects, and from time to time to test the extent to which these aims are being realized in practice. Such definition will require analysis of the larger aims in terms of the more specific social utilities, that is, educational values which result, or should result, from such studies. For example, should we teach Latin principally because of the effects of this study on the student's ability to use English? But what, more specifically, do we hope to accomplish in the direction of greater proficiency in the use of English? Do we aim to improve his comprehension of words through the knowledge of roots and sources gleaned in the study of Latin? Is it expected that translation of classics will result in improved capacity to write and speak English? Will the study of Latin grammar lead to readier and greater comprehension of English grammar? To what

extent does any given type of exercise or study produce the results expected? If further values of this study lie in "mental discipline," the Latin teacher should uncover these specific values, define them, show their relation to life, and devise means for realizing them through the use of his "subject." When he has clarified and tested his purposes, he will have obtained a sound basis for the study of methods.

Another example: in our high schools substantially all boys and girls are required to study algebra and geometry. What are the actual and valuable ends to be realized through these abstract mathematical studies? Algebra and geometry, as secondary-school studies, contain elements that are of obvious importance as instruments in a few higher studies and in a limited number of vocations; but does this fact justify the general prescription of these subjects in high-school curricula? Is there any evidence that the mathematical subjects, as taught, make visible contributions to the culture which is valuable in modern life? Can it be proven that they enhance the development of valuable intellectual qualities? Apart from their demonstrable educational uses, algebra and geometry should probably be regarded as studies of value to those pupils who are, or who readily can be, interested in them, and therefore should be entitled to a place in educational programs as fairly high-grade diversions. It is, therefore, not unreasonable to require that in the present state of educational knowledge we shall discover and formulate genuine and definite ends wherewith to justify the compulsory study of algebra and geometry as conditions of high-school graduation. We can at least place these studies on an elective rather than a prescriptive basis, and we can be honest enough to ascertain and tell the truth as to the limited field of their actual application in cultural and practical life.

Almost all the other subjects taught in the secondary school are as yet far from being really effective as educational instruments because of similar uncertainty as to the educational service which they should render. Sound educational science obviously requires that we should know the "social utilities"— the specific forms of culture, civic ideals, vocational power, etc. — which these studies can produce in and for men and women who, as a result in part of their school education, should serve in the world as cultivated individuals, good citizens, and competent workers.

THE PRACTICAL ARTS

During recent years the program of secondary education in many high schools has been enriched by the addition of subjects that may roughly be called the "practical arts." These include manual training, drawing, cooking, sewing, gardening or agriculture, and the so-called commercial subjects. The teaching of these subjects, also, has been rendered ineffective and often fruitless by the prevailing uncertainty as to what should be the controlling purposes in teaching them. Patrons of the high school have often assumed that the study of these subjects would give positive vocational power — that is, that boys taking manual training would thereby lay the foundations for successful artisanship of some kind; that the study of agriculture would lead to success in farming; that the study of cooking and sewing would greatly increase the home-making competency of girls; while the study of the commercial subjects would give valuable equipment toward the commercial occupations.

Educators have usually given only secondary place to vocational aims in the teaching of the practical arts. These subjects have been organized in abstract and general rather than in concrete and specific ways, and are taught in large measure by formal methods based on memorized text and laboratory exercise. The practical-arts studies have usually had only partial recognition even in the curricula of schools supposed to be devoted primarily to teaching these subjects. Little effort has been made to insure that their teachers should themselves have had prolonged experience, or be vocationally competent, in the practice of the occupations toward which such studies are supposed to lead. Only occasionally, and perhaps incidentally, have the foundations for specific or genuine vocational power been laid by practical-arts studies other than the commercial; and in many schools even these have actually led to important results only in the

minds of those who prefer to live in the land of "make believe." Enthusiastic teachers do at times arouse in their pupils what may rightly be called vocational ideals. Some pupils, after the successful pursuit of the practical-arts studies, have indeed later followed the callings related to them as a result of the suggestion obtained. But in general the aims that have controlled in the choice of materials of the courses of study, as well as methods of teaching, have been indeterminate, unsubstantial, and unproductive.

A "PIG CLUB" INSPECTING ITS PROPERTY

Recent experience proves that efficient vocational education of secondary grade requires a large degree of concentration in the practice and related study of the calling for which training is being given, and close adherence, in processes of training, to the concrete practices found in the business world. This means that when the time arrives to teach a youth in a vocational school to be a machinist, a printer, or farmer, or a girl to be a stenographer or a home maker, it is necessary that a large part of the learner's time, probably from six to eight hours of each working day, should be given to the practice of the actual work characteristic of the calling elected and to related technical studies based on such work. Any so-called program of vocational training for a person not already a worker, which involves but four or five hours per week, may prove to be not only ineffective, but positively negative and harmful as tending to produce the attitude of the dilettante. It now seems probable that vocational schools and courses, as parts of a general scheme of secondary education, must be organized somewhat apart from schools of general education, and must be

administered with especial reference to the requirements of the specific occupations for which they give training.

But there will certainly remain a place, and probably a large and important place, for the so-called practical arts in general secondary education. A satisfactory program of general or liberal education ought to offer opportunities for the development of the insight into modern economic processes which comes through study of those processes and participation in them in the spirit of the amateur, which is easily possible to high-school students. The boy who has had the opportunity to do some gardening, and to study the possible applications of science to agriculture, will be a more liberally educated man and a better citizen because of that experience. A girl may not be made conspicuously more efficient as a home maker by three or five hours' weekly instruction in the household arts; but if the course is sufficiently broad and realistic she can, through it, be made capable of rising to higher levels as a "consumer"; she can be made to appreciate the better standards that are available in home making, and she may be inspired to equip herself thoroughly therefor. It is not difficult to conceive possible uses for any or all phases of practical arts as means of genuine liberal education, especially for youths whose interests and capacities lie in these directions; but the responsibility lies with educators for clearly defining these aims preliminary to a formulation of means and methods of realizing them.

DEFINING OUR AIMS

The largest problem, then, which is still to be solved in much of secondary education is that of defining controlling aims in terms of genuine and demonstrable utilities. The most elementary analysis of these utilities will show that they fall into certain large groups such as those pertaining respectively to physical well-being, to vocational capacity, to useful citizenship, to personal culture, and to the "disciplined mind." Certain intellectual tools, such as reading and writing, must always be employed very generally; others, such as drawing, mathematics, and foreign language, will always have only specific and limited possibilities of application.

To the production of the numberless social utilities, material and spiritual, required in modern life as powers and capacities in the individual, various forms of education, besides those offered in schools, contribute in greater or less degree, sometimes positively, sometimes negatively. The home, the church, the workshop, the playground, the police power, the press, the stage, the library, the voluntary club — all these are educational agencies as well as the school. The public school should not undertake to accomplish in education what these agencies — which are in the main private and only remotely controlled by the state — can do fairly well of themselves. The school as an educational agency must do what these agencies cannot or will not do for positive education, this being peculiarly the mission of the public school because it is created by, and is responsible to, the state; that is, to all society, in a given state or local community, acting collectively.

Under each of the foregoing broad divisions — namely, physical education, vocational education, social education, cultural education, and education in the use of intellectual tools and in the formation of useful intellectual habits — the promoters of secondary-school education must discover a variety of social utilities which are to be realized by educational means, and which it is desirable and possible for the school to produce, rather than any other educational agency. The educator, in making the programs of secondary-school education for the future, must cease to depend solely or even chiefly upon traditional aims and traditional practices for guidance; he must study modern social economy to find valid aims for his work, and he must study a scientific psychology of adolescence to obtain light as to means and methods of realizing his aims. No greater work than this can be done for the future welfare of our country.

David Snedden

IF

IF you want to be a carpenter, a plumber, or an electrician, an engineer or a chemist, or to follow any of the other callings that make use of your hands as well as your head, begin at once to get ready for your chosen work. Don't think that, because you may not be able to go to a vocational school like the one that has been described, you cannot get special training. You have been told what boys are doing in those schools partly to show you how to start a private school of your own in which you are the teacher and your hands the scholars.

The first thing you must do is to train your hands to follow the bidding of your head. Take the volume on "Amateur Handicraft" and choose some one line which you will follow until your hands have learned to do just what you want them to. The skill you gain in one line will serve you well in another, for handicraft means literally "power with the hands." When you have gained it, it will carry you far in your chosen calling. While you are getting it, you can be having the fun of making a water wheel or a wireless set, a kite, book shelves, or a paper knife, or any of the other things the making of which is described in Volume VII.

IN HIS HOME WORKSHOP

WHAT IS INVISIBLE LIGHT?

IF a beam of sunlight is passed through a prism, it is seen to be divided into several bands of colored light which form what scientists call the "spectrum." At the lower end is red, then follow orange, yellow, green, blue, and violet. These bands of color, which can be distinguished by the eye, are known as the visible spectrum. (See Volume I, page 100.)

At either end of our visible spectrum are certain rays which cannot be seen, yet which play an important part in our well-being. These we may well term "invisible light."

Above the region of violet lies a group of rays called ultra-violet. These rays (together with certain of the violets) form the actinic, or chemical spectrum, which is the part of light that affects your photographic film when you take a snapshot.

WHAT VALUE HAS INVISIBLE LIGHT?

It has long been known that sunlight is essential to proper health and growth. Men and women who constantly work indoors are often pale and sickly. Small children who are denied a share of the health-giving powers of sunlight are seldom so rugged as their more fortunate playmates who can run about in the open. In fact they grow more slowly, and their bones are often soft or "rickety." Even domestic animals, poultry, and plants will not thrive if deprived of sunlight.

It has recently been discovered that the invisible, ultra-violet rays are really the most beneficial part of sunlight. Recognizing this, science now uses these rays in many forms of medical treatment, under such names as "heliotherapy," "actinotherapy," or "phototherapy," employing either the sun's rays or the light from especially constructed electric lamps.

The familiar mercury-vapor lamp, with its weird greenish light, is particularly rich in ultra-violet rays. They are also transmitted by fused quartz crystal. Consequently, many of the lamps made for medical purposes combine the mercury-vapor lamp with the transparent fused quartz, thus deriving the utmost power from the invisible rays. While the patient feels no heat from a lamp of this type, yet a comparatively short exposure to its rays sunburns or tans the skin as effectively as a summer's day at the shore.

Now that it is known that ultra-violet rays play such an important part in health, efforts are being made to provide windowpanes that will allow these rays to pass, so that those in schools, workshops, factories, stores, and offices may benefit. Ordinary window glass cuts off these rays completely.

WHAT KIND OF LIGHT WILL PIERCE FOG?

Fog is one of the greatest hazards to navigation, both on the sea and in the air. It is particularly dangerous to the aviator. He may stray from his course; he is unable to see the ground, and can seldom make a safe landing, especially at night, when the country is shrouded in darkness. Ordinary light struggles in vain to penetrate fog or heavy mist. Consequently scientists are attempting to develop a type of light that will be visible at a distance, no matter how murky the atmosphere may be.

When a current of electricity is passed through a tube filled with neon gas, a brilliant reddish-orange light results. This principle is used commercially in many illuminated advertising signs. Now engineers are applying it to a new purpose, and have designed huge neon lamps for use on aviation landing fields. This type of light can be seen for fairly long distances through fog or mist, appearing like a great ball of reddish fire.

It is probable that its further development will be of value as an aid to aërial navigation.

WHY IS A PERSON SEEKING OFFICE KNOWN AS A "CANDIDATE"?

IN ancient Rome men who wished to be chosen for an office dressed themselves in white to signify the purity of their motives and their intention to deal justly if elected. From this beautiful custom comes our word "candidate," meaning literally, as it did in those days, a "man clothed in white."

WHY DO WE SPEAK OF THIRTEEN AS A "BAKER'S DOZEN"?

In olden times the laws for bakers were very severe, and any shortage in weight or measure was punished by heavy penalties. To avoid the chance of falling below the standard, bakers allowed an extra loaf with every dozen.

WHY IS FALLING SNOW ALWAYS WHITE?

Snow is white because it is made up of tiny crystals which reflect all the light that falls upon them. (See Volume I, page 81.) The light of the sun, thus perfectly reflected, appears white.

WHY DO A CAT'S EYES SHINE IN THE DARK?

To shine in darkness a body must be luminous, or light-giving, and no creature possesses luminous eyes. A cat's eyes appear to shine in the dark because the very wide-open pupils catch what light there is, and an inner curtain acts like a mirror in reflecting the light. As her eyes reflect these rays they seem to us to shine with a light of their own.

WHY DOES A BABY TRY TO PUT EVERYTHING INTO ITS MOUTH?

Scientists tell us that the nerves of the mouth and tongue of the baby develop before those in other parts of his body. This is to make it pleasant for him to take his food, since he does not realize that he needs food in order to live. It is probable, then, that the baby puts things into his mouth to see if they, too, like his food, will give him pleasure.

WHY DOES IT REST US TO LIE DOWN?

Force of gravity is always pulling us toward the earth. A baby falls to the floor when it tries to walk because it has not enough strength to resist this force. An aged person stoops for the same reason. We may not realize it, but a large amount of energy is required just to keep ourselves in an upright position. Less energy is required to sit than to stand, and when we lie down we relieve all the tension necessary to keep the body upright. All the muscles can be relaxed, and the whole body rests.

WHY DOES A BOY'S VOICE BREAK, WHILE THAT OF A GIRL DOES NOT?

As a boy approaches maturity, his larynx enlarges. During the period of its growth, his vocal cords are not under perfect control, and his voice will break. A girl's larynx does not enlarge in the same manner, but only gradually with her growth, so that there is no time when her vocal cords are suddenly altered.

WHY DO THINGS HAVE DIFFERENT COLORS?

See Volume I, page 100.

WHY DOES THE SEA VARY IN COLOR?

See Volume I, page 196.

WHY IS IT HOTTEST AT THE EQUATOR?

See Volume I, page 91.

WHAT ANIMAL GOES FISHING WITH THE AID OF A LAMP?

IN the semidarkness of the deep seas there is a fish called the "deep sea angler." He goes about with a small luminous knob projecting from the top of his head. This attracts curious small fish. While they are investigating it, he makes a quick dash and thus secures his food.

WHAT FISH LAYS ITS EGGS ON A ROCK AND THEN GOES TO LIVE IN AN OLD TIN CAN?

After the female toadfish has laid her eggs, she finds some old tin can, or even an old shoe, crawls in, and with her mouth at the opening, stays there for the rest of the season, leaving her family to shift for itself.

WHAT DUCK LAYS ITS EGGS IN TREES?

The wood duck makes its nest in the limbs of a tree near a pond or stream and hatches its young there. The manner in which the ducklings are transported to the water has long been a question in dispute, but within a few days they are to be seen swimming. This duck is the most beautiful duck found on the American continent and much resembles the mandarin duck of the Orient.

WHAT INSECT LIVES IN A HOUSE MADE OF BUBBLES?

In every field and meadow during June and July bubble houses may be seen attached to the stems of grasses or weeds. Underneath each pile of bubbles, with its beak embedded in the stem, a little green bug is sucking the juices of the plant. He takes in such quantities of sap that it oozes out all over his body in little bubbles. This protects him from the sun until he has grown into a mature "frog hopper."

WHAT INSECT LOOKS LIKE A LOBSTER AND TAKES LONG JOURNEYS ON A FLY'S LEG?

The false scorpion, a tiny insect no larger than a pinhead, lives in dusty corners among old books and papers. He has a great passion for traveling, and when the first roving fly comes near, he will at once seize one of the fly's legs with those long lobster-shaped claws of his, and go sailing off through space dangling from the fly's foot.

WHAT INSECT CARRIES A LIGHT MORE EFFICIENT THAN THE BEST ARTIFICIAL LAMP INVENTED?

One of the greatest problems of the modern lighting engineer is to perfect a lamp that will give the most light with the least heat waste. The efficiency of the firefly's light is estimated at one hundred per cent, while from the gas jet, for example, only two per cent of the radiant energy consists of light rays.

WHAT ANIMAL FILLS ITS LEGS WITH WATER WHEN IT WALKS AND FOLDS THEM UP WHEN AT REST?

The starfish has hundreds of tiny hollow legs that it inflates with water when it wishes to walk. These feet reach out to some object, and with the aid of a sucking disk on each foot pull the body forward.

WHAT INSECT RIDES IN A BALLOON THAT HE MAKES HIMSELF?

See Volume III, page 20, under "Indian Summer Day"; also pages 327 and 329.

WHAT ANIMAL CAN BEAT AN AUTOMOBILE GOING SIXTY MILES AN HOUR?

See Volume III, page 156, under "The Jack Rabbit."

CUT FLOWERS

WHAT KINDS SHALL WE CHOOSE?

SOME flowers are so dainty and graceful that Nature seems to have designed them for cutting, while others are stiff, coarse, and quite out of place in the house. Among the best of the common decorative flowers are sweet peas, nasturtiums, scabiosa, Shirley poppies, asters, salpiglossis, gladioli, tall snapdragons, coreopsis, peonies, carnations, violets, lilies of the valley, gypsophila, godetias, and some forms of the dahlia. It is an excellent plan to plant several rows of flowers for cutting in a corner of the vegetable garden, where the blossoms may be grown like any garden crop.

HOW TO ARRANGE THEM

It is one thing to have cut flowers, and quite another to use them successfully. The proper arrangement of floral decorations is really an art, which has been carried so far in Japan that several distinct systems or schools have been developed. Some people seem to have a natural aptitude for displaying flowers to the best advantage, but there are a few principles which anyone may learn.

As a rule, not more than two kinds of flowers should be used together, and often the best results are obtained when each sort is kept by itself. Yet there are some exceptions. The airy babies'-breath (gypsophila), the modest lily of the valley, and the symmetrical carnation may be used to advantage with many different flowers. Gypsophila is most helpful when it is desired to give a light touch to a highly colored bouquet, but only a few sprays are needed. A cloud of it is worse than none.

It is not by cramming a vase full of flowers that attractive effects are secured. Quite the contrary. Often only four or five blossoms, with a little foliage, show to much better advantage than a great mass of bloom. It is always safe, however, to follow Nature. Flowers like rambler roses, sweet peas, and nasturtiums, which naturally grow in clusters or close together, may be so arranged in their vases. Dahlias, gladioli, and garden roses look absurd when crowded.

Irregularity is important in floral decoration, and it is never wise to put two vases exactly opposite on a table or in a room. Japanese experts generally eschew even numbers; they may put one flower or three or five in a vase, but not two or four. Balance is not to be overlooked, however, and if there is a tall vase in

the center of a long table, there should be a shorter vase and perhaps two of different heights at each end.

While admirable results are to be obtained by using contrasts, the weaker colors should always be in the majority or the effect will not be all that was expected. It is well to remember that weak combinations get weaker under the influence of artificial light. Blue or violet-colored flowers are handsome in the daytime, but quite lose their character when the lamps are lighted.

It is difficult to make a rule about color contrasts, because of the multitudes of different shades to be found in the realm of Flora. One must exercise judgment and learn by experience. White goes well, of course, with any color, which is one reason why gypsophila and lilies of the valley are used freely by decorators. Red or scarlet, which may look glaringly hot on a midsummer day, is quickly toned to a comfortable warmth by the addition of white. Yellows and blues go well in company. Lavender or purple with blue is distressing. With some flowers it is even possible wholly to disregard the rule about sticking to one or two colors, but one should make experiments privately and with discretion. There is this other point to be remembered also, that the best arrangement of cut flowers may appear little short of atrocious if placed in front of wall paper which is entirely out of harmony with the color scheme.

WHAT KIND OF VASES SHALL WE USE?

Vases in variety are needed by all who use cut flowers freely, but they need not be costly. Most of the beautiful and expensive vases found on the tables in many homes are little less than useless as flower holders. On the other hand, simple holders of clear glass are unrivaled for the display of flowers which have clean, smooth stems, while dull pottery vases and brass or copper bowls are able to give character and charm to flowers which otherwise would look extremely commonplace. Marigolds, goldenrod, coreopsis, and flowers of similar shades are delightful in bronze or copper pots.

Most flowers show to advantage in green pottery, but for blossoms like nasturtiums and sweet peas, which are borne in profusion, nothing is better than small fish globes, which are abominations as homes for fishes but splendid as flower holders. Short stems, like those of pansies, require saucers or plates. Often it is possible to raid the china cupboard for flower holders. Yellow daisies or dahlias are beautiful in pitchers of delf blue. Most white flowers also look well in blue ware.

Vases with narrow necks are to be avoided if one wishes to put them to actual use. Such vases keep out the oxygen and the flowers soon die. Wide mouths and full necks are desirable when even a single flower, like a great chrysanthemum or a wonderful rose, is to be shown. Yet the flower would look most unhappy if allowed to hang foolishly over the edge. The Japanese get around this difficulty by cutting a twig a little longer than the diameter of the vase and splitting one end. The twig is then pushed into place across the mouth of the vase an inch or two below the top and the flower stem thrust through the slit. This plan is also followed when several flowers are used in a wide-mouthed vase; for by the rules of all the Japanese schools, the top of the tallest flower must be exactly over the center of the holder, although the stem below may make a long and graceful curve.

The plan of using a slit stick is very simple, but in this country more common use is made of wire cloth with a small mesh. The wire is cut into a square slightly larger than the mouth of the vase and the sides bent to hold it securely when placed within the vase a little below the top. The flower stems are thrust through the meshes.

Low, flat vases or bowls have come into popularity of late. They are especially attractive when used as holders for flowers with stiff stems, like the daffodil and the iris. As no support is offered by the receptacle itself, metal or china holders, some of them in quaint and novel designs, are used to receive the stems. Crabs and frogs and turtles are among the creatures imitated by these holders, which are usually placed at the sides of the receptacle, in order to display a considerable expanse of clear water, on which a stemless pond lily or some other flower is allowed to float. Occasionally a few tiny goldfish are placed in the water.

HOW MAY THE FLOWERS BE KEPT FRESH?

When flowers are being prepared for the vases which are to receive them, the stems should be broken or cut with a sharp knife. Scissors are to be avoided, for the reason that they pinch the stems and so close the water passages. Every other day a half-inch should be cut from the stems, and at night the vases should be carefully filled with water and set on the floor in the hall or a cool room. Rain water is best for cut flowers; it must be changed every day in summer. It is unwise to have the stems resting on the bottom of the vase, for then they do not take up water freely; and if the mouth is completely filled with stems and foliage, the flowers will soon perish of suffocation.

SINGEING POPPY STEMS TO KEEP THE FLOWERS FRESH

Most flowers should be cut in the early morning, while the stems are full of sap, and, as a rule, before they have fully opened. Narcissi should be cut before the petals burst, and the gladioli when the two blooms at the bottom of the stalk have unfolded. Peonies are best cut when half-opened, and will last a week or more if properly cared for. Poppies should be cut in the bud, and wild flowers while wet with dew.

Dahlias sometimes prove a disappointment, but may be kept a long time if given a special kind of treatment. The flowers should be cut early and the stems stripped bare at the bottom, after which they should be thrust into water as hot as the hand can bear. They should be left there until the water cools, and then be placed in cold water and kept in the dark for twelve hours.

Flowers that have come from a distance and are withered may be revived by putting the stems into water which is just under the boiling point. It is a common practice of the Japanese to boil the stems of their flowers until white before putting them in cold water. When this plan is followed, it is always important to protect the flowers and foliage from the steam, and it is wise to wrap all but three or four inches of the stem in tissue paper.

In England, as well as in Japan, burning the flower stems in order to have the blossoms last an extra long time is practiced. A gas or candle flame is used and the ends of the stems roasted until black and charred, the upper part of the stems being wrapped in a damp cloth. Mere singeing is not sufficient. Poppies treated in this fashion may be kept fresh looking and with erect stems, even if cut when in blossom.

WHY DO FLOWERS FADE?

Flowers are put out by plants for the purpose of perfecting seed, which in its turn will produce new plants and flowers. The bright colors and perfumes attract the insects, which bring pollen to make the seeds fertile. When this has been done the need for the petals is gone. The plant calls its life-giving juices back into stalk and leaves, and the petals wither away.

WHAT WILDFLOWERS SHALL WE FIND IN EACH SEASON?

See Volume III, pages 333-386.

WHAT IS THE GAME OF ROQUE?

ROQUE is an improved form of croquet and requires a much greater degree of skill. A perfectly smooth dirt court is needed, with a very slightly sloping surface to carry away the water. This court is made by filling a shallow excavation with sifted loam, which is made level with a transit, rolled, and then covered with fine sand. Composition balls course across this smooth surface like ivory balls on a billiard table. In fact, roque has some resemblance to billiards, for all around the court runs a bank made of heavy timbers or of cement, against which the balls rebound. Delicate carom shots are often made on these banks.

PLAYING FOR POSITIONS AT THE BEGINNING OF A GAME OF ROQUE

The arches used in roque are three and three eighths inches wide, which is just one eighth inch wider than the diameter of the balls. They are made of heavy steel and fastened to blocks buried deeply in the ground. This is necessary because shots are often made against the wire, and balls frequently strike with terrific force. The mallets have short handles and sometimes are bound with brass to prevent splitting. Commonly one end is tipped with rubber, which helps in making fine shots.

Roque is a highly scientific game, and its devotees learn to make plays which seem almost impossible. The jump shot, which is a favorite with many experts, consists in making a ball pass entirely over one or more arches in order to hit another ball some distance away and perfectly safe from any ordinary style of play. The first ball is made to leap into the air by a peculiar downward stroke of the mallet.

HOW DID ROQUE GET ITS NAME?

The game of roque was given its name by the late Jared S. Babcock of New York, who evolved it by the simple expedient of omitting the

first and last letters from the word "croquet," making a word of one syllable. The name met with favor and was soon adopted all over the country as interest in the new form of croquet spread. A national tournament is held each year in Norwich, Conn. The Southern championship games are played in Washington, and there are many minor associations all over the country.

With a court lighted by electric or acetylene gas lights, roque may be played just as well in the evening as by daylight. This feature makes it highly popular in suburban communities and with business men who would have no other time to enjoy the game.

WHEN WAS CROQUET FIRST PLAYED?

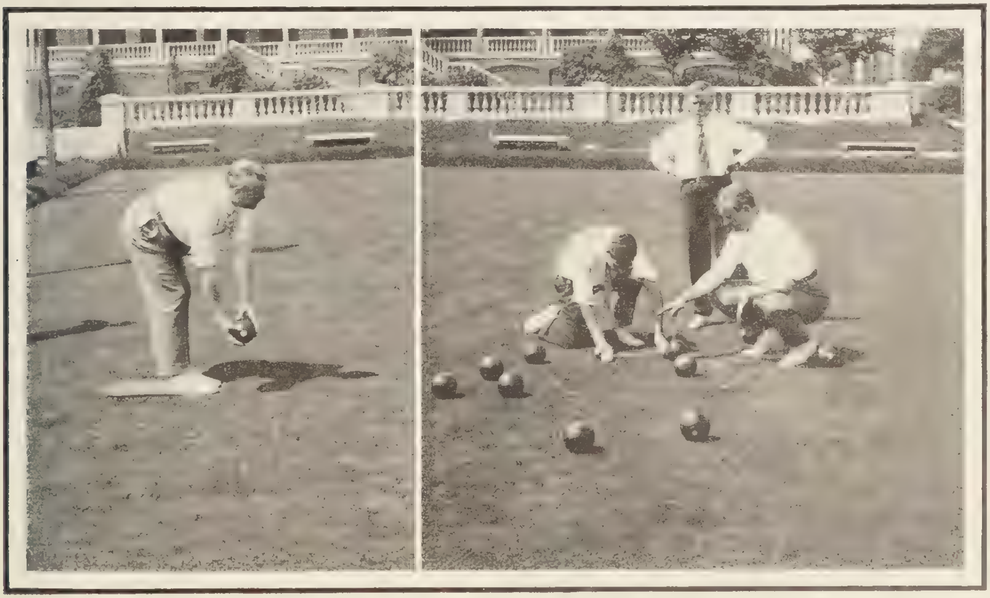
Croquet is the descendant of an old English game called "pall-mall," which was popular in England up to 1700. It was much played in London and gave its name to the famous street, Pall Mall. It died out entirely, but was revived in the middle of the nineteenth century from a remote part of Ireland, where it had been played through all the hundred and fifty years. Croquet was very popular for many years, but has been somewhat superseded by tennis.

WHERE DID WE GET THE GAME OF GOLF?

From Scotland, where it was known as "gouff," probably from the Scotch word meaning a "blow" or a "stroke." Golf is also said to be of Dutch origin, as a game of this nature called "kolf" was played hundreds of years ago in Holland and Belgium, usually on the ice. We know that it was played in Scotland as early as 1457, for at that time the local Parliament made laws about its abuse.

WHAT WAS THE ORIGIN OF BASKETBALL?

See Volume VI, page 116.



LAWN BOWLING

An English game brought to America by the colonists, who laid out many bowling greens. The balls are made of lignumvitæ, the hardest wood known. The players roll these balls at a much smaller white ball. In the illustration a player is starting to roll his ball and other players are measuring to see who has made the best score. The American game of bowling on alleys is a development of lawn bowls.

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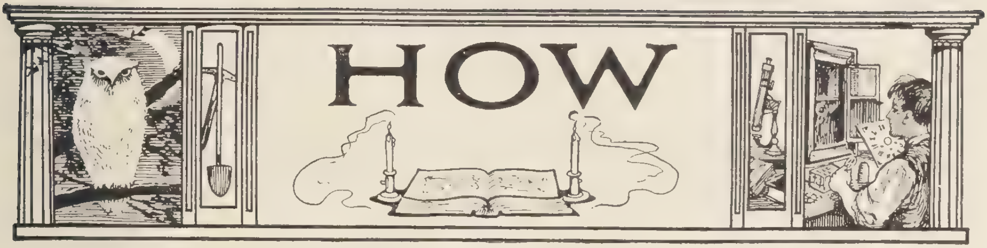
FROM OSTRICH FEATHER TO PLUME

A. Washing the feather. *B*. Picking up each separate flue or barb. *C*. Washing after bleaching. *D*. Sewing two or more feathers together. *E*. Curling. *F*. The finished plume.



HOW ARE OSTRICH PLUMES MADE?

A LARGE proportion of our ostrich feathers come from South Africa, though ostrich farming is carried on in California, Texas, Arizona, and Florida, and promises to be a highly profitable industry. But the feathers as they come to this country packed in bales are not the curling plumes seen in shop windows, but single straight feathers which must go through many processes before they show their real beauty.

First, they must be sorted into two groups, those with the more porous flues or barbs to be dyed, the others to remain undyed. Next, they are strung on strings of about fifty each, soaked in hot water for twenty-four hours, and put through wringers. When they have been soaked again in soapy hot water for another twenty-four hours, they are scrubbed, as in the picture on the opposite page, and then bleached for four hours in lukewarm water containing peroxide, alcohol, and ammonia. The scrubbing is very important, as the luster of the feather depends upon it. Still they are not ready to be curled, but must be soaked in cold water for two hours, thoroughly washed in soapy warm water, starched, and hung on a line for twenty-four hours.

Now the feathers are ready to be graded according to size, length, and width, and made into plumes. There are two ways to make a long, thick ostrich plume. A single feather may be filled out by small pieces sewed to it, or two or more feathers may be sewed together. From the number of feathers used in this latter process comes the name of the plume. One made of two feathers will be a "two-ply plume"; one of three feathers, a "three-ply." Curling is the final process before the plume is ready for the market, to be graded in cost according to the length and number of feathers used.

With this as with the other processes described in our "How" pages, we have an added respect for the products in our possession when we learn the many stages of their preparation.

HOW ARE HATS MADE?

Straw hats are made by braiding carefully prepared straw, stitching it together, damping it, stretching it upon a frame of the desired shape, and then pressing it.

Felt hats are more difficult. They are made from the felted fur of rabbits, hares, or musk-rats. Sometimes the fur of a small Brazilian creature called the "coypu," which is not unlike a beaver, is also used. The fur is first cleaned, sheared off by machinery, and mixed with a little cotton. This mixture then passes through a blowing machine which takes out all dirt and coarse hairs. It is next fed into a hollow cone filled with holes. As this machine turns slowly, a rapidly moving fan blows the fur against the sides of the cone, spreading it out evenly until it is matted. The cone is then wrapped in a wet cloth and set in a tank of water, which thickens the mat of fur and makes it tougher. This mat is called the "shell" of the hat. It is taken off the cone frame, squeezed, pressed, and sent to the hatter. The hatter submerges the shell again, this time in hot water, and shrinks and thickens it still more. He then dyes it, blocks it to give it the required shape and size, smooths it down by means of an emery wheel, curls the brim, and hands it over to girls who line, bind, and trim it.

Silk hats are made of stiffened muslin covered with silk plush, ironed down to the shiny blackness so familiar to us all. Pieces of stiff muslin of the necessary shape are fitted together over a wooden block and fastened by means of strips soaked in varnish. After the muslin frame is dry it is covered with the plush, which is ironed on. The heat from the iron melts the varnish

and sticks the plush firmly in place. The brim is then rolled and the hat bound, lined, and trimmed.

WHO BROUGHT THE SOFT FELT HAT TO AMERICA?

The famous Hungarian patriot, Kossuth, was responsible, it is said, for the soft felt hat in America. When he came to the United States in 1849, he wore a large, soft hat instead of the usual silk hat, or beaver, and the "Kossuth" immediately became popular.

HOW ARE PINS MADE?

It is hard to realize that it has taken many years to perfect so simple a thing as our common pin. But in the olden days pins were very far from being common. In Egyptian tombs we find pins with gold heads. In Greece and Rome clasps and buckles were used. But during the Middle Ages people used lacings of leather, thorns, and slivers of wood, bone, ivory, and shell to fasten their clothes. Pins were such a luxury that it was the custom to give a bride "pin money"; that is, money with which to buy pins, a custom from which we get our phrase.

The first pins were made of brass and bent and twisted badly. Furthermore, they were very expensive, as they were all made by hand. Now, thanks to American inventors, the first of whom is said to have been Lemuel Wright, who in 1831 invented a machine for making pins, most pins are made entirely by machinery.

The basis of the common white pin is brass wire, which is clipped to the required length and pointed. It then travels on a machine which flattens the head by jamming the end against a heavy weight. Next the head is shaped and rounded off. The pins are then cleaned in barrels of sawdust and put into kettles containing a mixture of tin and nitric acid, where they are boiled until each is coated with a thin silvery covering. After being polished once more in barrels of sawdust, they are ready to be set in papers and sold.

Common black pins are made from brass, which is boiled in japan varnish instead of being tinned. For the best grade of black pin, steel is used, the beadlike tops being made by dipping the heads of the pins in a solution of liquid glass.

It is an interesting fact that the United States is the largest pin manufacturer in the world, and that the people of the United States use more pins than any other nation.

HOW ARE NEEDLES SHAPED?

It used to be said that before a needle was finished one hundred persons had had a share in fashioning it. Machines have recently done away with much of the handling of needles, but the process is the same.

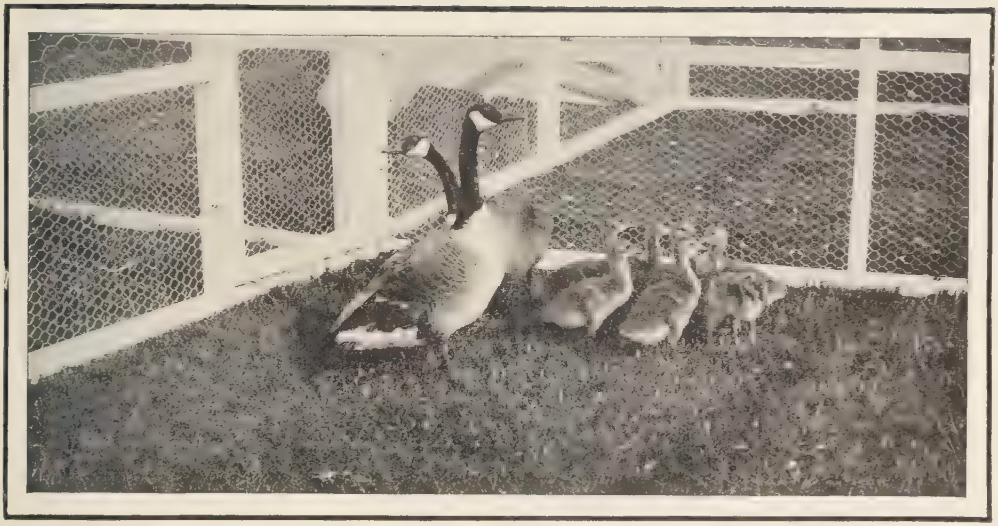
Needles are made from "blanks" or lengths of fine steel wire. These blanks are cut in pieces just long enough for two needles. Each end of the piece is sharpened by being ground down to a fine, flawless point. The middle of the piece is next flattened, and the spots are indicated where the eyes of the two needles are to be punched. When the holes have been made, a wire is run through the two eyes to hold the needles firmly in place, and the steel is bent until it breaks in halves. The needles are then heated, tempered to the necessary strength and hardness, and polished.

HOW ARE HOOKS AND EYES MADE?

Hooks and eyes are made from brass wire; this is because brass does not rust as would other material. They are often a by-product of pin making, being made at the same factories from material that will not do for pins. The wire which comes on reels is drawn into a machine by nippers and is there clipped off to the necessary length. One machine makes only the hooks and another the eyes. After the wire is cut to the right length, it is flattened and twisted into the desired shape. The brass hooks or eyes are then put into a kettle, where they are silvered or tinned in a solution of melted metal. If they are to be black, they are japanned with black varnish and then dried. After they are made, they are sewed upon cards and are ready for the shopper.

HOW DOES VELVET GET ITS FUR?

See Volume II, page 354.



CANADIAN GOOSE AND GOSLINGS

WHAT ARE THE COMMON BREEDS OF POULTRY, AND WHERE DID THEY COME FROM?

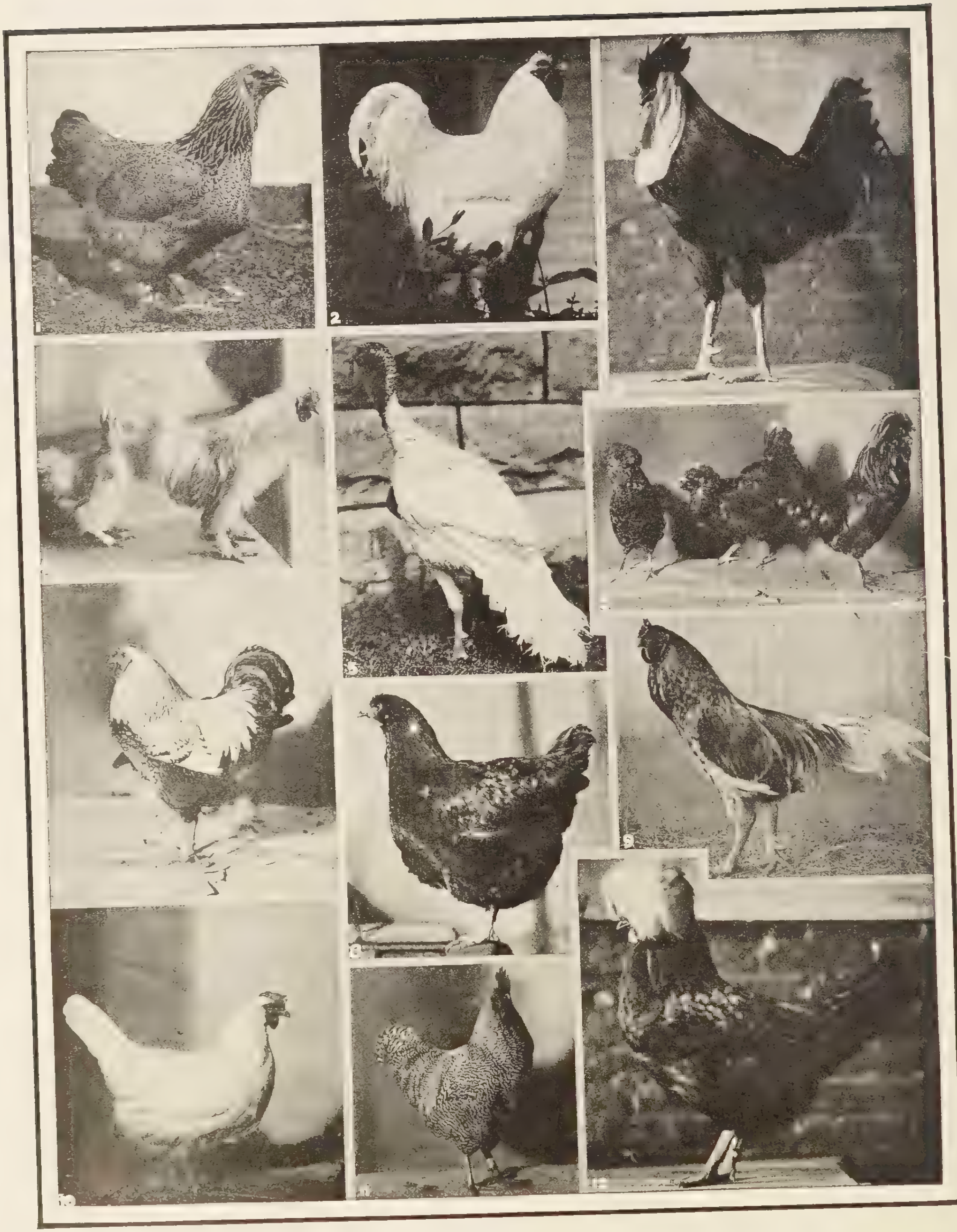
NOBODY is sure about the origin of our common domestic fowls, but it is certain that they came from the other side of the world. Some people believe that the jungle fowl of the Orient, specimens of which are still to be found, was the progenitor of all the breeds, but another theory assumes that both the domestic and the wild fowls sprang from an ancestor long ago extinct. At any rate, it is probable that the first domestic poultry were very small, perhaps no larger than partridges, and that egg production was extremely limited. The oldest domestic fowl is the Aseel, which has been bred in India for three thousand years. The Chinese kept hens at a date as early as 1400 B. C., according to the traditions of the country. The movement westward was gradual, and probably Europeans knew nothing about hens and chickens much before the beginning of the Christian era. Domestic fowls came to the United States with the early settlers.

HOW ARE THE BREEDS GROUPED?

The poultry of long ago differed greatly from that of to-day. Scores of new breeds have been developed, and even now the types are in a state of constant transition. Distinct types have been evolved in different parts of the world, and poultrymen have divided these types into classes, largely geographical. Along the shores of the Mediterranean Sea are to be found several breeds of light, active, heavy-laying fowls. They have long combs, as a rule, and are largely nonsitters. These breeds constitute what is known as the Mediterranean class, and include the leghorns, Minorcas, Anconas, Spanish, blue Andalusians, and Sicilian buttercups, all of which lay white eggs.

Varieties of a wholly different character were established in China and other parts of the Orient, where heavy, massive birds, with small combs and feathered shanks, came into being. The breeds of this type include the cochins, brahmas, and Langshans, and are classed as Asiatics. The hens of these breeds are slow of motion, frequently become broody, and lay large, brown eggs.

What is called the English class include the Dorkings, Orpingtons, and red caps, all rather large breeds and excellent for the table. The Orpingtons in several colors — buff, black, white, and blue — are the only English fowls well known in the United States.



TWELVE BREEDS OF POULTRY

1. Dark brahma. 2. White plymouth rock. 3. White-faced black Spanish. 4. A pair of silkies. 5. White Holland Turkey. 6. Houdan cock and hens. 7. Silver wyandotte. 8. Buff Orpington. 9. White-laced red Cornish. 10. White leghorn. 11. Barred plymouth rock. 12. White-crested black Spanish hen.

In the French class are the Houdans, of which many are bred in this country, crèvecœurs, Faverolles, and la flèche, seldom seen here. The Houdans are mottled black and white and carry large topknots. They lay white eggs and are nonsitters. Other breeds seldom even heard of in America are also bred in France.

Hamburg and Polish fowls in various solid and mixed colors are bred mostly for exhibition purposes. The Polish fowls have elaborate crests, while the Hamburgs carry large rose combs. Holland was the original home of the Hamburgs, but that the Polish fowls really came from Poland has been seriously questioned.

Finally there is the American class, made up of breeds secured from curious mixtures of nearly all the Old World breeds. American breeders have been working for years to secure a type which should be prolific in egg production and yet dress well for the table. As a result have come such breeds as the barred and the white plymouth rocks, the wyandottes in several varieties, the Rhode Island reds, and the buckeyes. All these breeds weigh from five to ten pounds, have yellow skins and smooth, yellow legs, and lay brown eggs. No better general-purpose fowls have ever been known, and these are the ideal breeds for the American farmer. They are not quite equal to the leghorns, however, for egg production, and white leghorns are kept on most of the large commercial egg farms. Yet the leghorns are too small to be of much value as table birds, and in some sections of the country, New England in particular, there is a prejudice — entirely without foundation — against white eggs. It is an interesting sidelight on the peculiarities of egg farming that buyers in New York City are willing to pay a premium of several cents a dozen in order to obtain eggs which have pure white shells. Obviously one needs to consider one's market before taking up poultry culture in a commercial way.

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SPRING CHICKENS

WHERE DID TURKEYS AND GUINEA FOWLS COME FROM?

The turkey is a native American bird and one of which we may be proud. Formerly the wild turkey roamed over most of the continent, but there were several varieties. Early comers carried turkeys back to England, where they became plentiful in the fourteenth century. Then some of these domesticated birds were brought back to this country by later settlers. The common varieties of the present day are the bronze, white Holland, Narragansett, buff, and red. In parts of Europe a black variety is common. More bronze turkeys than any other kind are bred in the United States, and the type is one which cannot well be improved upon.

Turkeys do not take kindly to confinement. They are restless and do not grow well, but when they have a wide range they mature rapidly. The hen lays thirty-five or forty eggs, and twenty-eight days are required to hatch them. The "poults," as the young turkeys are called, are alert and active as soon as they come from the nest and are likely to wander away if not watched.

Guinea fowls also like to roam, but are very hardy and require but little attention. They came from Africa originally, but the Greeks and Romans were familiar with them and reared them for table purposes. The pearl guinea is the common variety, but white guineas are also raised.

As a rule guineas mate in pairs if left to themselves; the hen prefers to lay her eggs in a secluded spot of her choosing. While she sits, her mate remains close by as though keeping guard. It is always considered wise to use a wooden spoon if any of the eggs are removed from the nest in the absence of the hen, for if she detects the odor of a human hand she is likely to desert her eggs and make a new nest. It is wise, also, to leave at least five eggs in the nest at all times after the hen begins to lay. Four weeks are required for incubation.

Guineas are very noisy, but often are valuable on the farm for that very reason. They are awakened by the slightest sound, and it is impossible for an intruder to gain admission to the poultry house or yards without detection by these birds, which are certain to sound an alarm that can be heard a long distance. The male and female are practically alike in appearance, but may be distinguished by one who is familiar with their calls. Guineas are unsurpassed for table poultry, and large numbers are now being served in hotels and restaurants as substitutes for game, which is becoming rare.

WHAT ARE THE COMMON BREEDS OF DUCKS?

Of the many breeds of ducks, useful or ornamental, five are popular in the United States and Canada. They are Pekings, Indian runners, muscovies, Rouens, and Cayugas. White Pekings are raised in large numbers for table purposes and are especially well adapted to that purpose, for they may be made to weigh six pounds in ten weeks. On some of the leading duck ranches from forty to eighty thousand ducklings are grown in a single season, and the feathers alone constitute an item of considerable profit.

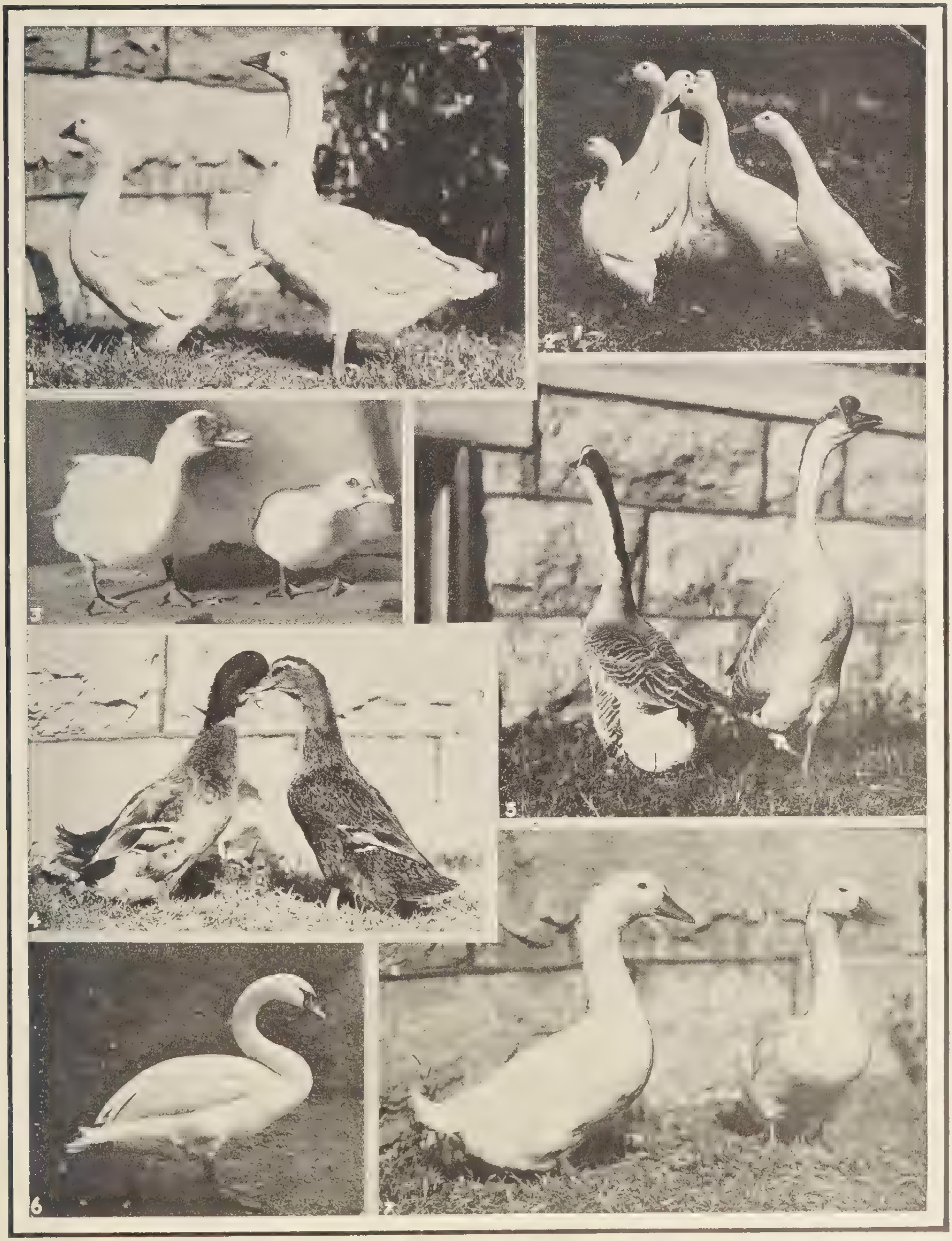
Before the Pekings were introduced to this country, muscovies were depended upon largely for table ducks. There are colored and white varieties, and South America was the original home of this breed. Muscovies are odd-looking birds, carrying large, bright red patches of corrugated skin on their heads. They move slowly and awkwardly on their feet, but are able to fly long distances, and when they are kept in confinement it is necessary to clip their wings. It is a peculiarity of these birds that they are not able to quack like other ducks. They make almost no noise of any kind, for which reason they may be raised in places where ducks of other breeds would soon become nuisances because of their noise. Five weeks are needed for the hatching of the eggs laid by muscovy ducks, while those of other ducks are hatched in four weeks.

It is supposed that nearly all domesticated ducks have descended from the wild mallard. There is no question about a direct line of descent when the Rouen is under discussion. The Rouen weighs nearly twice as much as the mallard, to be sure, but the markings are much the same. The black Cayuga is also a large duck. It takes its name from Cayuga County in New York State, where it originated. It is the one strictly American duck.

The ducks so far mentioned are bred for meat. The Indian runner is an egg breed and is so prolific that it has been termed the leghorn of the duck family. There are three varieties — fawn, penciled, and pure white — all small, very active, and remarkably intelligent. The eggs are large, six often weighing a pound, and are excellent for the table as well as for culinary purposes. Good strains of runners lay only white eggs, and there is a growing market for them. It is generally admitted that these ducks were not originated in India, although there are differences of opinion as to what country did know them first, and it is probable that they will come to be designated simply as runner ducks, a name which suits them very well.

HOW ARE GEESE RAISED?

Geese, as every schoolboy knows, once saved Rome from the invaders. They must, therefore, have been known to the ancients; but doubtless the geese of Rome were different in many respects from those of modern breeds. The breeds common in this country are Emdens, Toulouse, Chinese, African, and Canadian, the



DUCKS AND GEESE

1. Emden geese. 2. White Indian runner ducks. 3. White muscovies. 4. Rouen ducks. 5. Brown Chinese geese. 6. White or royal swan. 7. Peking ducks.

last named being a handsome wild variety which is easily domesticated.

Emden and Toulouse geese are raised in large numbers for table purposes. The others are raised more largely by fanciers, and Canadian geese are often used by hunters as decoys. Emdens are white, and Toulouse gray. The former came from Germany and the latter from France, where they have been held in high esteem for many years. Specimens of these varieties often weigh as much as twenty pounds. Goose growing is profitable if a large area of low or waste land is available. Pasturage is important, for geese graze much like cattle, but water for swimming is not necessary. In several sections of the country there are fattening concerns which buy up thousands of geese in the fall and fit them for the Thanksgiving and Christmas trade by feeding them heavily on corn meal. Sometimes the geese are driven over the road for several miles.

Chinese geese are very ornamental. There are two varieties — white and brown — and they have long, arched necks. At the base of the beak is a large, round knob, which fanciers like to have as large as it is possible to obtain it. These geese are easy to keep, will pick up much of their living if allowed to roam, and require water only for drinking. There is no reason why this breed should not be kept for utility. African geese are also large and may be raised profitably, but they have dark skins and are hard to pick. They, too, have a knob at the base of the beak.

Geese are commonly mated in trios, although young birds are often paired. A pair of geese mated early will remain true for many years, the gander paying no attention to other females. Geese live to be as old as fifty years, but the ganders become vicious and unruly before they reach the age of ten years, and are not kept for a long period unless remarkably good breeders. Ganders have frequently been known to inflict severe injuries on women and children, and are able to give even a strong man a hard struggle for the mastery.

WHAT IS THE ROYAL BIRD OF ENGLAND?

The swan. At one time no one in England could keep swans without a royal permit. Even now the birds belonging to the king bear a distinct mark.

WHO ARE THE GREATEST SUGAR EATERS?

The English-speaking peoples. According to a recent census the average amount of sugar used by every person in England in a year was 86.3 pounds; in the United States, 81.6 pounds. Denmark had an average of 77.7 pounds; Switzerland, 64.3; Germany, France, and Holland each about 40 pounds. Italy, Greece, and Servia reduced the amount to seven pounds for each person. This record is interesting, since sugar is said to be very necessary for our bodily nutrition and, taken in reasonable quantity, to produce energy for work.

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A SMALL INCUBATOR WITH THE CHICKS COMING OUT OF THE SHELLS

WHAT SHALL WE CHOOSE FOR PETS?

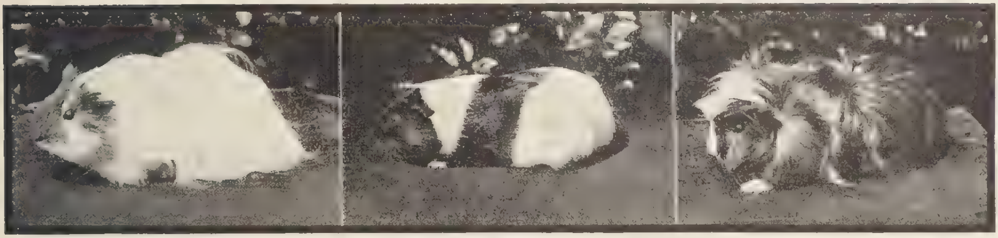
MOST children crave pets and find pleasure in caring for them. Yet the keeping of pets is not confined to those young in years; thousands of adults find recreation in the company of high-bred dogs, fancy rabbits and guinea pigs (cavies), bantam fowls, or ornamental pigeons. Annual shows for the exhibition of all the classes of pets mentioned are held in various parts of the country and high prices are often paid for choice specimens.

WHAT ABOUT RABBITS?

Apart from dogs and cats, it is probable that rabbits are the best-known and most popular pets. The stupid little pink-eyed white rabbit commonly seen is not, however, the kind to choose. The Himalayan and the Dutch rabbits are more intelligent, easier to raise, and more satisfactory in all ways. The handsome coat of the Himalayan rabbit is sometimes called "mock ermine." It is very soft and white, but the ears, nose, feet, and tail are brownish-black. The eyes are pink, and the combination of colors is highly attractive. These rabbits weigh from five to seven pounds.

Dutch rabbits are somewhat smaller and may be easily distinguished by a white band around the neck and a white blaze on the nose. The white band often covers the shoulders, but animals so marked are not considered high-class specimens. The rest of the body may be black, blue, or lemon-colored. The ears are short and stand erect, giving the animal an alert appearance which is an excellent indication of his character.

Long, woolly coats make the Angora rabbit easy to identify. The white specimens are the most popular, but other colors are seen. In this country Angora rabbits are not bred in large numbers, as it is a difficult matter to keep the coat clean and free from knots. But in parts of Europe this same coat gives them a distinct commercial value, for the wool is used for the manufacture of wearing apparel. It is not sheared like the wool of sheep, but the



GUINEA PIGS — CAVIES

Angora cavy, a rare variety. English or smooth-coated cavy, the most common sort. Peruvian cavy.

combings are carefully saved and the amount secured from each rabbit in the course of a year is worth several dollars.

WHAT ARE GUINEA PIGS?

To begin with, they are not pigs at all, and there is no reason for giving them such a name. They are properly called "cavies," and they came originally from South America. Their size is about half that of rabbits, and they possess no neck worth speaking of. Few animals are more stupid, and they have short lives; but they are excellent pets for children because they are perfectly harmless, and they please the eye, for which reason they are bred by many adult fanciers.

The three principal classes are the following: the Peruvian or long-haired cavy, the Abyssinian or rough-coated cavy, and the English

RABBITS

Top (left): Black Dutch rabbit. Top (right): Angora rabbit. Bottom (left): English rabbit. Bottom (right): Belgian hare.

A CARRIER PIGEON RACE STARTING FROM THE CRYSTAL PALACE, LONDON

or smooth-coated cavy. The last named is the kind most often seen and the variety commonly used for experimental purposes. Good Peruvians have coats which sweep the ground, even hiding the head and face. Naturally these animals are not easily kept in condition; very long hair must be rolled up and tied on papers when the cavies are not being exhibited.

Abyssinian cavies are covered with peculiar rosettes, from which the hairs radiate, and are bred in various solid and mixed colors. English cavies have very firm, smooth coats, and the colors include red, black, fawn, white, cream, and chocolate, but specimens in broken colors are most common. Cavies may be fed and cared for in much the same manner as rabbits, with which they get along well.

WHAT ARE THE BEST BANTAMS?

There are no better pets than bantam fowls. Not only are they handsome, tame, and easy to care for, but some of them actually pay their way in the eggs they lay. These eggs are small, it is true, but quite large enough to use in the kitchen. Houses are easily constructed from dry-goods boxes, and a small flock may be fed largely on waste from the family table.

As pets for boys and girls, probably the cochins, brahmas, and plymouth rocks are the best bantams to keep. They are hardy, lay fairly well, and become very tame if handled frequently. Adult fanciers may prefer breeds which are not quite so easy to rear, although it takes an expert to breed prize winners in any variety. Seabrights are small, trim, and saucy, and it is a peculiar fact that the cock is feathered practically like the hen. The aristocratic appearance of the Japanese bantams wins them many admirers. Their long wings touch the ground, and their broad tails, which are carried very high, almost reach their heads. Rosecomb bantams have white ear lobes and long tails and a stylish carriage. Booted white bantams get their name from the appearance of the legs, on which are long, stiff feathers or vulture hocks, which reach almost to the ground. In Polish bantams we have a pocket edition of ordinary Polish fowls. Most bantams are rather delicate, and it hardly pays to hatch them very early in the season.

WHAT SHALL WE KEEP FOR PIGEONS?

To attend an exhibition of fancy pigeons is to be filled with wonder at the large number of varieties shown, as well as the interest manifested by all sorts of people. Among the popular varieties are tumblers, owls, jacobins, fantails, archangels, carriers, pouters, magpies, and nuns. Tumblers are particularly interesting

A PET BLACK COCHIN BANTAM

because of their habit of turning somersaults in the air, a performance which they will repeat many times. Fantails are common and are often allowed their liberty; they get their name, of course, from their ability to spread their tails into enormous fans. The pouter is a very odd-appearing bird when it expands its esophagus, almost hiding the rest of its body behind the great balloon. Jacobins are marked by recurved feathers on their heads, which give them the appearance of wearing hoods.

Carrier pigeons have often been made to serve useful purposes in carrying messages. Years ago they were taken to sea in ships for the purpose of bringing messages back to land, and often were made use of in war. When Paris was besieged, in 1871, communication with the outside world was carried on by means of these birds. The common practice is to

A BABY RACCOON

write on the lightest and most flimsy paper, which is tied to the leg of the pigeon. There are a number of carrier-pigeon societies in this country, and races are held at intervals, the birds being taken to distant points and released. The certainty and speed with which they return to their lofts is surprising.

WHAT OTHER PETS ARE KEPT?

Squirrels make interesting pets, if taken from the nest or captured very young. It is not worth while trying to tame an old squirrel. Stale bread and milk and soaked corn make good rations for young animals. White mice are popular with boys, but seldom with their sisters. It is important to keep their cages clean, and an application of hot water and carbolic soap three times a week will be needed. Fresh bread or hot corn should not be fed, but the mice will revel in a loaf of stale bread and make tunnels all through it.

Raccoons and opossums are surprisingly quick and intelligent and are continually doing amusing things, but they are not such good pets when they grow old as when young. The best way to confine them is to attach one end of a chain to a collar on their necks and the other end to a pole by a ring in such a way that it will slide up and down. They will spend much time traveling up and down the pole. A box or barrel will provide shelter.

WHAT ARE THE BEST DOGS FOR PETS?

Dogs are popular pets the world over, but many of them belong to no recognized breed and lead a more or less precarious existence. Some dogs are purely ornamental, some are useful, and some are both. Also, unfortunately, some are neither. There are fifty breeds or more in this country, but certain kinds are especially suitable for pets. In the country the larger breeds may be kept to advantage. Collies are perhaps the favorite dogs with people who have farms or small country homes. They are active, alert, excellent companions, and good watchdogs. They are somewhat easily excited, though, and occasionally commit serious mistakes through losing their heads.

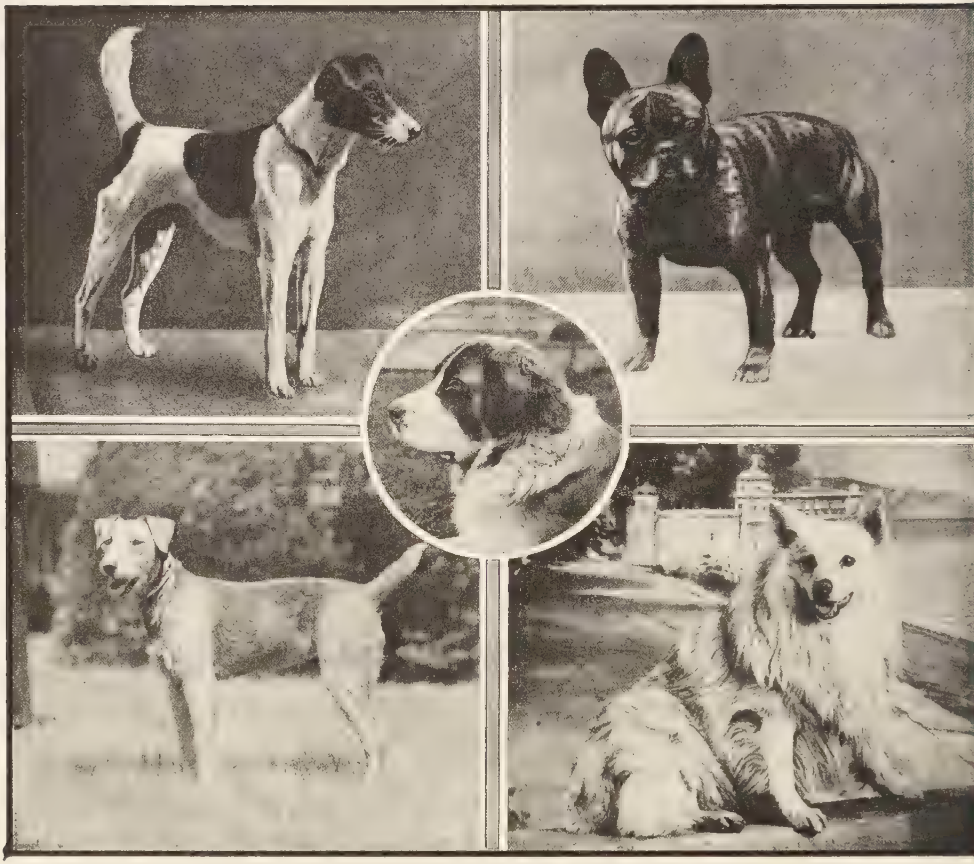
Another breed which finds favor in the country, as well as among the owners of suburban homes, is the Airedale terrier, an unusually intelligent dog, easily trained and notably faithful. The Airedale is an excellent watchdog and a useful guard. To be sure, he is not handsome, with his hard, wiry, tan-colored coat and his long, flat skull, but his alert movements and upstanding appearance suggest both intelligence and strength.

There are other terriers in variety, some of which are satisfactory pets. Scotch terriers are small but powerfully put together, with keen, expressive eyes and unlimited vitality. They are very companionable, and are ready to give tongue at the appearance of intruders. Fox terriers are popular house dogs, good ratters, friendly, and plucky. They are noisy, however, and inclined to kill cats, and they have been bred so long for exhibition purposes that they are often nervous and high strung. There are two varieties, smooth-coated and wire-haired. As a rule, Irish terriers have better tempers and are hardier. They have hard, wiry hair which sheds water, they love to catch rats, and are good dogs to have around a place.

Being a cross between a bulldog and a terrier, the bull terrier naturally enough never goes around a stump to avoid a fight; yet he is likely

FIELD SPANIELS THAT ARE GOOD HUNTING DOGS

Top: A black cocker spaniel. Bottom: Welsh springers.



TOP: FOX TERRIER; FRENCH BULLDOG. CENTER: ST. BERNARD. BOTTOM: AIREDALE TERRIER; POMERANIAN

to be friendly with other dogs on the street, although making war on any which trespass on his domains. Bulldogs are very affectionate and like to be in the house, yet are not to be especially recommended as pets.

No doubt the Boston terrier is the favorite canine pet of people who live in cities. This is essentially an American dog, obtained by the crossing of the small bulldog and the bull terrier. The breed is marked by a square skull and a prominent eye. The nose should be black and the face marked with a white blaze. Boston terriers are neat and intelligent, and are ideal show dogs. They vary greatly in disposition and are not always to be trusted.

Setters have an ancient lineage, for records in which they are mentioned date as far back as the year 1335. There are three breeds: the English, which is white speckled with black; the Gordon, which is rich plum black, with dark tan markings; and the Irish setter, which is golden chestnut in color. The English breed is divided into two varieties, Llewellyns and Laveracks. All setters are large, handsome dogs, with soft, silky hair and a fringe on the under part of the tail, which shows to especial advantage when the dog flushes a bird. Although largely used for hunting, they are splendid pets when they can be kept much in the open air. They are obedient, friendly, and intelligent and serve well for watchdogs.

Pointers are hunting dogs, too, and are able

to go a long time without water. It is commonly said that they are easier to train than the setter, but they have the reputation of being more snappish. They are strong-boned, short-haired, rat-tailed, and cat-footed, and unexcelled before a gun.

Spaniels are closely associated with setters. In early times, indeed, the latter were called "setting spaniels." Cockers are the best known of the spaniels and are excellent house pets. They like to be noticed, but their dispositions are not always of the best. The Irish water spaniel is the curious, old-fashioned-looking animal occasionally seen in America, with a coat consisting of short, crisp curls and a topknot falling over his eyes.

SCOTCH TERRIER

Twenty years ago the poodle was one of the most popular pet dogs, but of late years has become a victim of fashion's caprice. As a house dog he cannot be excelled, except that he is sometimes inclined to be surly and jealous. His intelligence is attested by the fact that he is the dog most often chosen for the performance of stage tricks. The pug, too, is an ideal household pet. He is neither too large nor too small, his coat is clean and smooth, and he is playful, good-natured, and quick to learn manners and tricks. He is a particularly good playmate for children.

Bulldogs, being English, are supposed to typify British pluck. Their best friends cannot call them handsome, but their grim and threatening

SCOTCH COLLIE

features conceal a heart as warm as that which beats in any dog. Their good nature is proverbial among dog lovers, and they are stanch defenders of master or mistress. Sometimes, however, they attack animals without reason, and the death grip of their jaws can be loosened only by choking them.

In times past Italian greyhounds were popular pets with women of fashion, but they are not bred commonly now except for exhibition. Whippets look like miniature greyhounds and are exceedingly swift. It is a practice among English people to race them and to train them for racing from puppyhood. The beagle is a small member of the hound family, but has the most musical cry. These dogs have very long ears, are noted hunters, and are sometimes called "rabbit hounds." They are quiet, peaceable, and good dogs for the country.

Many people think that the dachshund is a member of the hound family, but that is a mistake. The name comes from the German words *dachs*, a "badger," and *hund*, a "dog." Everybody is familiar with pictures of this breed, if not with the dog itself, for its long-drawn-out body commands attention wherever seen. A good dog is forty-four inches from point of nose to tip of tail, yet stands only ten and a half inches high. Dachshunds are quick-witted, but rather hard to manage, and are not to be recommended as pets.

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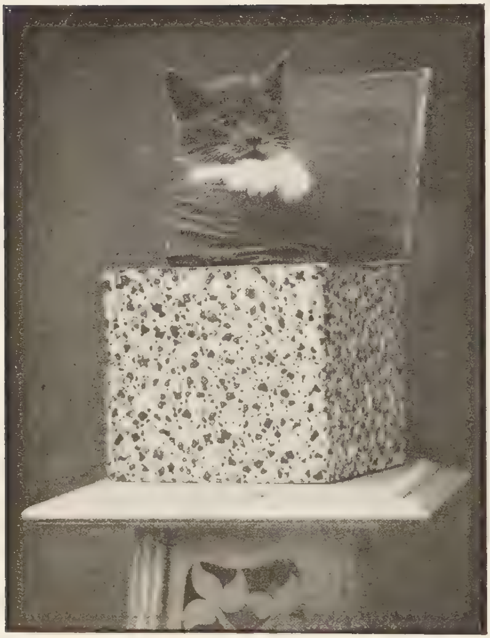
HIS MASTER'S UMBRELLA

Of late years Pomeranians have come into favor. They have long, fine coats and make excellent show dogs. They are best bred for that purpose, too; for while they are unusually good watchdogs, in that they are certain to arouse the household if intruders attempt an entrance, they are inclined to be snappish and should never be allowed at liberty where there are children. This applies to a large extent to

CARLOS, THE KING OF NEWFOUNDLAND DOGS



several of the lap dogs which are popular pets with society women — the Pekingese, the griffon, and the toy spaniel, for example. While pretty and interesting to watch, they possess only a moderate amount of intelligence, and are likely to be so jealous of children as to bite them. Pictures of some of these breeds are also shown in Volume III, pages 236–239.

WHAT VARIETIES OF CATS ARE THERE?

It comes as a surprise to many people to learn that there are numerous varieties of cats. Common cats are, of course, very common indeed. Persian, Angora, Manx, and Siamese varieties are less often seen. In the shows Persians and Angoras are entered as one class and are called simply "long-haired cats." The varieties differ in one distinct respect. Persian cats have one long coat, while Angoras have two — an undercoat and an overcoat, if you please. Color counts for much with long-haired cats. Silvers are the most valuable, while those which are pure white come next. White Persians or Angoras with blue eyes are, for some unaccountable reason, almost always deaf. One peculiar physical feature marks Manx cats — they have no tails at all or only a stub. They are docile, friendly, and very agile. Siamese cats are lithe and graceful and in color are silver gray, with black ears, legs, and tails.

PERSIAN KITTENS

A TIGER CAT

Look at the picture of members of the cat family, Volume III, page 217.

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PETS ON SHIPBOARD

This captain has a farmyard on board his ship. In the upper pictures you see him feeding his poultry and opening his dovecot; in the lower, with his dogs and his rabbits.

HOME VOCATIONS FOR GIRLS

HOW can a girl earn money at home? How can she turn her talents to profit? These are the questions which hundreds of girls are asking, and the answer is often not so far to seek as they think. It lies, not in some distant field of expert training, but in the cultivation of some home-discovered talent.

But I have no talents, the average girl replies; and by this she means that she can neither sing nor play the piano nor paint with any but ordinary ability. These are accomplishments, delightful in society but no more useful in the world of money making than a dozen other more homely gifts. Popular magazines are full of hints as to how a bright girl can earn money at home. When you have read them, what is at the bottom of every one? You must find out something that you can do or make that other people want done or made. Society is divided into producers and consumers, and all of us alternate between being one or the other. When you buy of the marketman, you are the consumer of his products. When you find something which you can produce that the public desires and will buy, you are in the position of a producer, a money getter instead of a money spender.

Choosing a vocation sounds like a big and solemn undertaking, and so it is. But most of us do not come to the need of this choice without some experience to guide us. We do not stand at the parting of the ways with all the world before us and deliberately select the employment most pleasing to us from an ideal standpoint. We must consider what we are most fitted for, and what adapts itself best to our home conditions. Don't you like the old-fashioned Anglo-Saxon translation of the word "vocation" — a "calling"? Keep it in mind as you read the next pages, telling what other girls have done, and see if any of them help you to discover what your "calling" is, what your tastes and ability and surroundings call you to do.

THE LINE BETWEEN AMATEUR AND PROFESSIONAL

From the field of sport we learn that the narrow boundary line between amateur and professional work is crossed when money is accepted in return for services rendered. The same distinction holds in the world of trade. With a single purchasing customer your handiwork takes on a money value, and your skill in producing it becomes a factor in your possible choice of a vocation. Up to this time you have made dresses or cooked or done your father's typewriting for pleasure in the work itself and in the product, as well as in meeting your own or the family need. It was a good way to work, as it is a good way to play games, in the spirit expressed by Kipling as he pictures that happy future time —

> "When no one shall work for money,
> And no one shall work for fame,
> But each for the joy of the working,
> And each in his separate star,
> Shall draw the Thing as he sees It
> For the God of Things as They Are."

But the earnest and enthusiastic amateur need not lose the spirit of joy in her work when she crosses the line and becomes in a small way professional. Nor is the change to be regretted here as it is in the world of sport. We are sorry to see a game become a business. But it is only the proper and satisfying outcome of a girl's growth when her natural aptitudes and inclinations, developed for pleasure, point the way to a congenial means of earning her own living or at least her spending money.

WHAT IS THE MODERN ATTITUDE?

From the days of our great-grandmothers, when woman's work was in her home and the exchange of money was in the hands of men, there has been handed down an idea that the fine edge has been taken off a lady's position when she receives money for her work. In our modern coöperative living this is no longer true. All honor and congratulations to the girl whose family is so well off financially that she need not consider the money return and can give her services freely and joyously to her circle of friends and neighbors. But such prosperity may not always continue. Let her cultivate her handicraft until it is a possible vocation by which she might in time of need support herself.

A GREENHOUSE FROM WHICH A WOMAN MAKES A GOOD LIVING

The owner of this greenhouse fills weekly contracts for florists and wealthy patrons by parcel post, sending sweet peas, carnations, calla lilies, violets, jonquils, and other flowers in their seasons.

GROWING FLOWERS AND PLANTS TO SELL

EVERY normal person hungers for flowers and the green things of the country. This is why city florists can charge fabulous prices for small bunches of violets or lady's slippers, or maidenhair fern. Because all of us have this love of the things which suggest sunshine, blue skies, and soft breezes, every home maker likes to have flowers on the table and plants in the window. But not every person has the skill or the patience to grow them successfully. It is with flowers as with children: one must tend them lovingly and patiently to get the best results.

RAISING THE OLD-FASHIONED PLANTS

Many a girl could learn from somebody's old-fashioned grandmother the secrets of certain plants which could be sold to friends or to some florist. The Cape jasmine, as the old folks have always called it, is full of poetry and romance, and it is not at all uncommon for a city florist to charge fifty cents for one blossom. If one shows surprise at this price, the florist will shrug his shoulders and say, "It is very difficult to raise the plants." But if a girl loves flowers and is eager to earn a little money, she would do well to study into the ways of this plant. She can sell slips, flowers, and whole plants.

THE PLANTS THAT ARE ALWAYS IN DEMAND

Any plant which will pot well and make a good display on a small stand or table in a living room or dining room is suitable to experiment with. Certain of the begonias, and all of the ferns, ivies, and hanging or climbing plants are always in demand. Some florists charge as much as seventy-five cents for a small pot of ivy which is well rooted. Of course, if a person sells to a florist, she does not get more than half as much as the florist asks, and for this reason she should sell directly to customers when possible.

HOW TO ADVERTISE

Often, even when sadly in need of money, a girl will hesitate to try to sell the flowers and plants which she can raise. She hates to let her friends and acquaintances know that she is trying to earn money. This is a foolish bit of false pride. Nothing ventured, nothing won. Every person whose opinion is worth while will admire any girl who has energy and pluck enough to devise such a means of earning money. Your advertising can be of the very simplest. Either put an attractive placard in your window or in a conspicuous place, or send out attractive little visiting cards on which you have written, "Orders taken for ferns and ivy," or something similar. If you prove especially successful, you can put an advertisement in your home paper.

HOW TO SUCCEED WITH FLOWERS

Sometimes it is the garden flowers which will attract the ambitious girl. One woman earns

A PANSY FARM ON A VACANT CITY LOT

SEED SOWING BY A HAND DRILL

about certain plants or flowers, and will patiently tend them. If lice, frost, and molds bring failure, then study how to kill lice, to destroy mold, and to ward against frost.

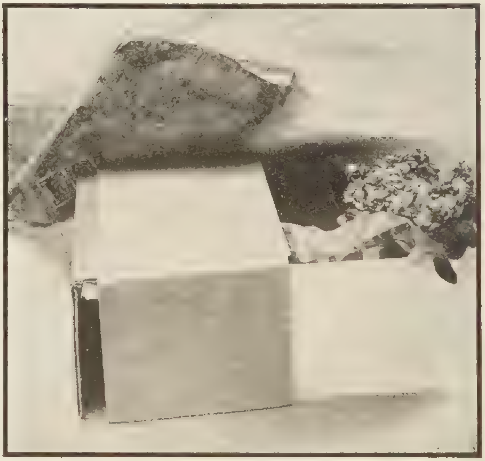
If you are earnest in your work, you will become so fascinated that you will never think of giving up. The wonder and beauty of living things will so impress your heart and mind that you will unconsciously set higher standards because of them.

WHAT CAN BE DONE WITH WILD-FLOWERS

Perhaps you live in the country, where all kinds of wild flowers, ferns, mosses, and the like abound. In such a case you may decide that you will be wise to gather and sell these, instead of raising anything in your house or garden. One young woman recently devised the scheme of gathering partridge vines, when the berries were red, and storing these with moss until the Christmas season. She then filled round glass bowls with this green and red mass and sold them by the dozen to stores and florists. With very little effort she made large sums of money. Keep your eyes open and you will think of something as original as this.

a large sum each year with her fleur-de-lis. She buys the finest roots, provides the best soil, and tends them carefully, and the result is almost bewildering. One who has seen her flowers can never forget them. Another has especial success with lilies of the valley, another with dahlias, and still another with chrysanthemums. Those who are the most successful are the ones who confine their efforts to one or two flowers. If one attempts a great deal she is apt to fail with all. Mrs. Margaret Deland, author of "Old Chester Tales," has a jonquil sale every spring for the benefit of some charity.

Do not let your desire to earn money quickly get you into trouble. You must be prepared to spend one season in experimenting. No matter what we undertake, apparent failures are a part of our training. Simply say to yourself that you will learn all that you can



VIOLETS READY FOR MAILING

A school teacher in Michigan raises these violets and ships them by parcel post.

HOME DRESSMAKING

THERE is an old saying that "money saved is money earned." Nowhere is this more true than in the field of home dressmaking. The girl who can make her pay envelope or her allowance do double duty by buying simple materials and fashioning them into dresses and underwear is rewarded for all the trouble she may have taken to learn the rudiments of sewing.

If the modern girl had to follow some of the fashions on the following page, with their ruffles, basques, tucks and intricate construction, she might well hesitate to undertake the making of her own clothes. In nothing has the twentieth-century woman exhibited her good sense and her sense of relative values to more practical purpose than in the simplicity of her clothing. In so doing she has eliminated many of the difficulties of home dressmaking; but nothing can eliminate the need on the part of every girl for some skill in the use of her needle and ability in the planning of clothes.

Simple sewing is learned from a girl's mother and in school. Many a high school has the sensible custom of having the girls graduate in dresses of their own making, a practical demonstration of their art which appeals greatly to parents and taxpayers and makes also for democracy in dress. The girl who does not go beyond the grade-school lessons in sewing should take great pains to master the art of using a pattern. The excellence of the various pattern sheets which can be purchased at a low cost makes it easy to plan one of the inexpensive summer dresses of which every girl wants several. To plan a dress is to become a creator. It satisfies something in the soul of every girl and woman to create. The family of a well-known author of my acquaintance say that they always know when a book or magazine article is completed by the way she turns joyfully to the manufacture of a dress for herself. The creative faculty is so strong in her that it must be exercised; but it rests her to turn from the brain work of writing and the putting of her thoughts on paper to the use of her creative faculty on "goods by the yard" and its expression in work with the hands.

Home dressmaking is not simply a matter of sewing, by hand or machine. It begins with the picturing of the dress in one's mind. This, in turn, goes back to a study of shop windows, of the pictures in the women's magazines, of the fashion sheets, and most of all of the clothes of one's friends and neighbors. The clever girl studies herself to see what colors look best on her. She knows whether severe lines or the softer draping of goods best fits her style. She analyzes the clothes of others, not with a snobbish and critical air which would make her unpleasant in her social attitude, but with a joy in colors that harmonize and in little touches that relieve severity and in an appraisal of the reasons for the lack of success of some costume. Then when she goes to the store to make her purchases, she is ready to choose intelligently. When she happens to walk past some counter where remnants are being shown at half-price, she can select quickly a piece of goods which will fit into her plan for the combination of two colors. A girl of my acquaintance picked up at a sale a brushed wool sweater, the last of a stock which was being disposed of to make room for new spring goods, for one fourth its original price. Then she carried it for days in her shopping bag, pulling it out as she passed through the yard-goods section of one store after another at the time of her lunch hour. The color proved to be most difficult to match. But her search was rewarded. Within a fortnight, she had purchased a remnant of woolen goods of exactly the right shade to make a skirt to wear with the sweater. She appeared in the early summer in a costume which might well have come out of one of the high-priced sports' shops. She had spent about one fourth the amount of money needed to purchase one of these fashionable costumes, and she had had the added pleasure of planning and creating the effect she had in mind.

For "finishing" a dress, which is the technical term for all those last stitches on collar and cuffs and other more difficult parts of the work, it is worth while to have taken the pains to learn to do them in the right and approved way. This sounds like one of the copybook maxims of our childhood, but, like many of those maxims, it is true. In general it takes

ONE HUNDRED YEARS OF FASHIONS

longer in the end to fit and refit where there have been haste and lack of skill in the work than to learn from one's mother, from a teacher, or from a neighboring dressmaker just how this kind of work is done and how to do it in this way. This is particularly true for the girl who intends to use her gift of sewing and home dressmaking commercially, and no girl knows when it may prove a convenient money-making asset for her.

In every town and city there is a call for the home seamstress. Mothers with growing children need to have some one who can come in and work with them or for them on the letting down of dresses, the adding of colored bands which will ornament a dress that has grown faded or worn, the making of rompers for babies and blouses for the bigger brother. The girl who will fit in to this need will find herself in constant demand provided she knows how to do this work neatly, skilfully and quickly. But the modern demand calls for all three of these qualities. It is one of the challenging phases of our own time that no work is tolerated which is not efficient. While there are times when this insistence on a high standard may seem to work hardship on the individual who needs work, there is in it a stimulus to the girl who wants to become a professional in any line of undertaking. Good work is appreciated and well paid for. It was never more worth while to learn to do work of this standard.

Within the past few years girls have done interesting things along these lines. One girl of my acquaintance has specialized in doll dressmaking. (See Volume Seven, pages 143–157.) Needed at home in a large family where her mother could not carry the cares of homemaker alone, she still had a good deal of free time which she wished to turn to use in some money-making occupation. It began with her dressing dolls for a church fair. Then some one came to the doll table with a small daughter whose doll was not of the size for any of the extra sweaters and gowns which were awaiting sale. This girl offered to make a dress to measure for this doll, like one which its youthful mother desired. That was the beginning. A busy club woman, wishing to send a doll to her grandchild in China, found the date of mailing for Christmas delivery drawing near with the doll still reposing unclothed in her bureau drawer. My friend was called in to make a complete wardrobe. From that has grown a real business of doll dressmaking, which is on the point of expanding into sewing for the children themselves as well as for their dolls.

Mending is a task which is dreaded by the busy housekeeper. One girl pays for her music lessons by going one morning a week to mend for a neighbor who likes to cook and clean but has never become handy with her needle.

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Mending can often be taken home, too, instead of being done at the house of the one who wishes it done. I well remember, when I tore a three-cornered hole in a gown that was almost new during my Freshman year at college, with what despair I looked at it, dreading to send it home, until an upper classman said, "Take it to Betty Smith. She does fine mending for the same price that other girls charge for tutoring." Betty repaired that hole in a way that won praise from my critical mother at the Christmas holidays.

Girls who have undertaken home dressmaking as a profession have found it well to specialize in one or two lines of work. Two girls have built up a good business making pretty smocks and middy blouses for girls of school age. They run a regular mail-order business, sending out

their cards at the beginning of the spring season, submitting samples of colors to inquiring customers, and then making the articles in quantity for their trade. By having a limited set of colors from which choice must be made, and by repeating the same kind of work over and over again, they can buy their goods at wholesale economically and can cut and work faster and more skilfully than they could if they were constantly varying their patterns.

So to every girl I would say to take all the chances you can get in the busy life of school and home for sewing and planning your clothes. Watch other people's clothes for ideas. Make up your own budget of how much you want to spend on clothes, and see if you cannot buy the more expensive coat of your desire provided you save the extra money by making some simple dress for yourself. For home as well as commercial work every girl should become an expert on prices. She should know her own intended clothes' budget. She should take advantage of her mother's knowledge of textiles to help her to spend her money wisely on goods that will last instead of cheap materials which are made up with a fancy finish but which do not stand up under hard wear. She should figure up after each piece of underwear or each dress or blouse is completed just how much it cost, down to the last cent for snaps or buttons or a silk tie. Some time there may come a year when she will want very much to do some big thing. "How much will you need for clothes for this year?" her father may ask. If she can produce a neat notebook showing her clothes' expenditures for the last three years, she will go far towards convincing him that her project is safe and sane and that she can be trusted to finance it.

HOME MILLINERY

THE making and trimming of hats is not so mysterious a process as some persons seem to think. Often the city stores charge such fabulous prices for plain little hats trimmed with plain little bows that we feel sure there must be some strange mystery about the art. This is not so. Much, if not most, of millinery is a mere mechanical matter of frames, straws, ribbons, and bows. To learn millinery as a trade it is absolutely necessary for a girl to enter some large shop or store, and begin from the beginning. That is, she must learn how to begin with rolls of wire, thread, material by the yard, and build up any kind of a shape and style. But the average girl need not bother with all this. For home millinery the girl will buy her frames already made, and sometimes already covered.

It is true, of course, that some girls have no knack for millinery. But there is no girl who with patience and care cannot learn how to make the various kinds of folds and bows which make up two thirds of hat trimming. However elaborate some of the styles for each season may be, there are always hats which can be suitably trimmed with bows and lengths of ribbon. Thus a girl who has learned how to do the seemingly unimportant part of bow making has really learned enough to keep herself in pretty and stylish tailored hats. There is at all times such a demand for well-made bows that the large department stores in the large cities keep at least one girl at the ribbon counter busy doing only the one thing of tying bows for customers. Go and watch her some time when you go to a large store as she sits behind her counter, winding yards of ribbon into effective, shapely loops and knots.

The retrimming of old hats will probably be the beginner's most hopeful field of action. Learn how to steam mussed velvet till it looks like new, how to turn faded ribbon so that the faded spots are hidden, how to freshen up flowers and feathers. You will also be well repaid by learning something about dyeing.

If by your efforts you accomplish nothing more than the trimming of your own and your family's hats, your time and energy have been well spent.

LEARNING TO USE THE TYPEWRITER

FEW girls will not at some time have the opportunity to use a typewriter, and often the securing of a desirable position will hinge upon one's ability to use this modern writing machine. Therefore, any girl who expects to have to earn her living should seize the first opportunity to learn typewriting. She may even be wise in forcing a way of doing this. Especially in a city, the key to practically

every business position is typewriting or typewriting and stenography. If you can learn to use a typewriter in spare moments while you are yet at school and before you must start in to work, you will have a great advantage.

GET A SECOND-HAND MACHINE

Hire the use of a second-hand typewriter if you can. If you can't, save up your money and buy a fifteen-dollar second-hand one of a good make. Whether the machine is rented or owned by you, treat it with the greatest care and consideration. A typewriter must be cleaned and oiled as carefully as an automobile. If you treat it well, you can get as much service out of your second-hand machine as you could out of a new one. Do not start in with your practice until you know the meaning of all the queer-looking parts. With every rented or purchased typewriter the dealer should send a printed description of all its parts and their uses. Insist on having such a set of printed instructions, or get someone to explain everything to you. Your father or your brother will be helpful in studying into the mysteries of the machine.

GO SLOWLY

Do not expect to be able to write a letter or a composition the first day. In fact, you should do only exercises at first. Speed and accuracy in typewriting can be acquired only by learning to do things in the right way. You must practice finger exercises to become a good typewritist just as you must to become a good pianist. There are certain fingers for certain keys, and there is a certain angle at which the wrists must be held. To learn how to do things correctly, a girl must have someone to tell her or must have a book containing full instructions and exercises. Any dealer who rents and sells machines can recommend such a book to you, and it will be economy to buy it unless you have some person to help you out.

LEARN THE "TOUCH" METHOD

You should learn what is called the "touch" method; that is, to keep your eyes on your copy and not on your keys. It takes longer to learn this method (which is described on page 217), but it pays in the end. A girl may think that because she does not expect ever to earn her living by typewriting, she need not bother with a special method. But the best method is always the best, and every girl should take pride in doing things the best way.

A part of typewriting consists in spelling and punctuating correctly. Blunders of this kind are often overlooked in handwriting, but on the typewritten page they loom up formidably to disconcert the girl who has "learned better" in school. Never let any letter or copied matter go from your hands until you are sure that it contains no misspelled words. Keep a dictionary and a book on punctuation always at hand.

When you can typewrite quickly and accurately, you may call on your friends to recommend you for copying, but not until then.

HOME SHAMPOOING AND MANICURING

To be wholesomely attractive, one must not only be well dressed, but must have well-cared-for hair, skin, and nails. Any girl or woman can care for herself in these respects if she will give the necessary time each day. No girl is too young to give attention to these things, for it is only by making these a matter of habit that she can always present an attractive appearance.

Every girl should learn the easiest and most beneficial methods of washing the hair, caring for the scalp, cleaning and massaging the face and neck, and caring for the hands. Let her learn to do these things for herself and then offer to do them for her sisters and mother. Try it for yourself. Take your mother in hand once a week and give her what will prove a genuine treat — a massaging of the scalp and the face and neck, and a manicuring of the nails. At first you will be a little awkward in doing these things for another person, but remind yourself that you may sometimes want to earn your living by shampooing and manicuring, and have earnest persistence.

Even schoolgirls may be able to earn a tidy little sum of money each month by performing these tasks for their friends and acquaintances,

but no one should attempt to work on another person until she has mastered the art of caring for herself.

CLEAN HAIR IS NECESSARY TO HEALTH

The most important of these personal services is the care of the hair. No matter how beautiful of face or figure a person may be, she cannot be attractive unless she has healthy hair and a clean scalp. The average person should have her hair washed once a month. For a shampoo, use liquid castile soap (which you should make yourself by cutting up the cake soap and reducing to a liquid by means of boiling water), to which add a small amount of glycerine and, if you like, a few drops of perfumery. Keep this shampoo in a bottle, and just before using add warm water so that nothing cold shall come in contact with the scalp. Rub this liquid thoroughly into the scalp and hair until a lather is made, then wash the hair in warm water in a basin or bathroom bowl. After the hair has been washed once, drain off the water and wash it again with the liquid soap and warm water, and then rinse it in warm water. Be sure that at no time in the process of shampooing does cold water touch the scalp. Many persons have supposed that to prevent one from taking cold it was necessary to rinse the hair in perfectly cold water. This is all wrong and injures the hair. The rubbing which must be given the scalp in order to dry it will be an effective preventive of a cold.

Never dry your own hair or another person's by means of hot air. Sunshine, dry towels, fans, and massage are the only means which may be safely applied to the scalp. An expert person can wash and dry even a large head of hair in an hour's time by using only the hands.

If a head is simply dirty, it requires no other treatment than to be washed clean. If, however, the scalp is dry and scaly, the oil glands are not doing their duty and must be assisted. A little oil (olive oil is generally used) should be carefully rubbed into the scalp before and after the shampoo. It is not easy for one to do this for herself, but another person can rub the oil in without affecting the hair. If a head is oily, with or without a dark yellow dandruff, it should be carefully tended until this tendency is corrected.

Aside from oil for dry scalps, there is no tonic so good for the head and hair as frequent massages and systematic shampoos. But every girl should impress it upon herself and her friends for whom she works that puffs, rats, and curling tongs *always* mean falling hair and an unhealthy scalp.

HOW TO HAVE A HEALTHY SKIN

It should be every girl's ambition to have a *clean* skin. If one goes into commercial treatment of the face and neck, she must study carefully the physiology of the skin, but for ordinary purposes it is sufficient to know that the pores of the skin must be kept open and the circulation of the blood under the skin must be good. If the face and neck are full of blackheads and pimples, massaging and "washing" are necessary. Strange as it may seem, some persons do not wash themselves thoroughly. If a face has a tendency to blackheads, it must be thoroughly scrubbed at least twice a day. Before washing such a skin, soften it by using cold cream, or by steaming it, then wash with a soft scrubbing brush and soap and warm water. To clean the face and neck, warm water and soaps are necessary; but to *tone* them, cold water and vigorous rubbing must be used.

Don't rub and polish a skin that is already healthy and rosy; just keep it clean.

CARING FOR THE HANDS

The care of the hands consists chiefly in trimming the nails and keeping the flesh around the nails firm and even. The nails should always be filed, never cut with scissors. Before filing the nails, the hands should be soaked for a minute in warm water to which castile soap and a little borax have been added. Clean under the nails with an orange stick, and also use this stick in gently pressing the skin back from the nails. For stained nails, use peroxide. Pointed, highly polished nails are not in good taste. It is better to round the nails to the shape of the fingers, and to rub them only enough to make them clean and smooth.

A SIGN WITH MOVABLE SLIDES

THE HOME SALESROOM

WHETHER a girl lives in the country or in the city, it is always possible to earn a little money by making articles of food for sale. These can either be sold in the home or be taken to a town or city store to be sold. If conditions permit, the best way is to have a salesroom in the home.

It is not necessary to make a large number of articles of food. In fact, the most successful persons are those who attempt only a few things. One young woman has attained local fame and a ready sale for conserves — strawberry, raspberry, currant, grape, and the like. These she sells in little jars, or makes them, to order, into sandwiches for parties, teas, and picnics. Another person makes only such things as grape juice, raspberry shrub, and elderberry wine.

DEALING IN BREAD

If you live in a practical, matter-of-fact community, where one must deal in the necessities, learn to make good bread, rolls, biscuit, and pies. More than one girl has earned her way into college, with her mother's help, of course, by means of pies, doughnuts, and cake. Even to confine your efforts to bread making may be the best thing. Strange as it may seem, the demand for good bread is always greater than the supply. If you succeed in making bread which is indisputably of the first quality, you will be justified in charging a slightly higher price per loaf than the ordinary bakery or store does. It may be only a passing fad, but now the demand for breads includes whole wheat loaves, bran bread, rye bread, and nut bread. Many doctors are prescribing a constant use of bran bread for their patients. The ordinary baker will not bother with these special kinds of breads, and this is the opportunity of the enterprising girl.

Go to the doctors of your community and tell them that you are prepared to make digestible bread of any kind to order, and get from them the names of persons who might wish to place their orders with you. You may shrink from approaching doctors and others who are strangers to you, but it is a perfectly legitimate thing to do. Be dignified and in earnest, and if you meet an occasional rebuff that hurts, remember that it has injured the person who gave it more than it could you. Some of the largest, most successful food salesrooms have had their beginning in a modest little "bread" undertaking.

STUDY YOUR FIELD

Before you start in with the actual process of preparing food, it is absolutely necessary to study your field. Perhaps your community is so healthy that whole wheat and bran breads would prove a drug on the market. Your effort must be either to supply something for which there is a distinct need, or to create a demand for something which you think the community would want if it were available. For instance, perhaps in your neighborhood there are many lodgers who now take their meals out, but who would prefer to get their meals in their rooms if they could. Here would be your opportunity at noon, or at night, as the case might be, to have hot and inviting

cooked meats, vegetables, and desserts ready, and sell these by the order or by weight. This would be a somewhat ambitious undertaking, and at first should be done cautiously. Every beginning should be small. It is only in this way that one can experiment safely.

WHAT ONE WOMAN DID

Persons who live in isolated sections cannot of course have home salesrooms, but they are not for this reason cut off from making foods for sale. One woman who lives on a farm ten miles from a village, in the winter has more eggs than she can sell at the little country store. She therefore makes these into angel cakes and gold cakes (using the whites for one and the yolks for the other), and once a week drives to the village and sells these to the hotel and to private families. Where there is a will there must always be a way. What this woman did any girl can do.

BE DAINTY IN EVERYTHING

Whether you dispose of your food articles in the country or in the city, you must take every pains to give a dainty appearance to everything that you sell. Wrap each cake or loaf of bread in oiled paper, and let the outside wrapper be of an attractive brown color if possible. Use a good quality of twine, and make your knots secure. Have both your food and your bundles as artistic as possible. The finer the quality of that work, the higher you can let your pride soar and incidentally the more money you will make.

THE HOME TEAROOM

A SIMPLE UNDERTAKING

FOR one reason or another many girls and their mothers find it necessary to add to the family income. But the mother cannot go away from home, for she is both home maker and housekeeper, and often the daughter is also needed at home. Then how is the extra money to be earned? Many girls have answered this question by opening a piazza or indoor tearoom.

The tearoom is a comparatively new feature of American life, but it has seemingly come to stay. It is a "home" institution, and all of the most successful ones have been carried on in some dainty room of one's home or on a secluded porch. This means that very little money is required to make the venture. What is absolutely necessary, however, is to make the tearoom spotlessly clean, extremely dainty, and the service of the best.

THE FITTING OUT IS INEXPENSIVE

Without exception the most successful tearooms have been furnished inexpensively. Muslin, chintz, cretonnes, and Japanese crêpes can all be bought for from ten to twenty-five cents a yard. The hangings at the windows should match the doilies used for the tables. One tearoom has blue and white Japanese crêpe (fifteen cents a yard) at the windows, and also made into little shades for the lamps and into table mats. The mats are straight oblong pieces, perhaps ten inches wide and as long as necessary to hang six inches over the edge of the table on either side. Two of these mats, placed so as to intersect at the center, are all the table covering that is needed. The tearoom style is to have no tablecloths, and sometimes only a dainty paper doily is used.

If you do not have any small stands or tables which can be used, have your enterprising small brother, or a local carpenter, make you a few small round or square tables — preferably round. Stain these yourself, unless you can get it done cheaply. The dark, Mission style of stain is the most suitable. If possible, have hardwood tables, for it is easier to keep these clean. They do not absorb the grease and dirt as soft wood does. However, suitable tables can be made from soft pine.

MAKING THE ROOM ATTRACTIVE

Use as little furniture as possible in your tearoom. Put nothing on the walls that is not dainty and attractive. It is far better to have nothing at all on the walls but appropriate paper or cool-looking grass cloth, than ill-chosen pictures and fancy bric-à-brac. Whatever else you may or may not have, you should

always fill the room with flowers. Put these on the tables, in the windows, and everywhere possible. Wild flowers and ferns are even more acceptable and suitable than cultivated ones.

SERVE ONLY THE BEST OF FOOD

Of course, the tearoom exists for the purpose of giving refreshment to passers-by. Therefore the dainty, well-arranged tearoom is simply an attractive spot in which to serve light meals. At first these rooms were opened only a few hours in the afternoon for the serving of tea, coffee, lemonade, cakes, and sandwiches. But the demand for all-day tearooms has been so great that now in all parts of the country one will come upon signs tacked to trees and fences which point the way to places always ready for the chance customer. Especially in somewhat isolated sections where long-distance travel by automobile furnishes the patrons for the tearoom, the mistress must be prepared, early and late, to serve all kinds of things. But whatever the temptation, one should never serve anything that is not of the best. If you have had bad luck with your cake, don't serve it. Say that you have only sandwiches. A good cup of tea with plain bread-and-butter sandwiches is more acceptable to a tired traveler than poorly made cake or cookies.

Experiment with the making of tea (several kinds), coffee, lemonade, and fruit punch, until you are absolutely sure of your skill in this direction. The next most important thing is to be able to make good sandwiches, inexpensively. Here is ample chance for ingenuity. Nuts, olives, cheeses, jellies, marmalades, conserves, etc., may all be used in various combinations. One must also be adept in the making of one kind of cake, and of some such hot dishes as omelet, creamed chicken, or Welsh rarebit. The menu which one will offer must of course vary with conditions. A penny must be saved here and there to make up the total of one's profits.

A SUCCESSFUL WAYSIDE TEAROOM

What one farmer's wife has done, surely anyone who is on a main road can do! She lives in the mountains of Vermont, fifteen miles from a railroad. Her home is a little, tumbledown house near the roadside. She is trying hard to pay off the mortgage, and with the help of her sixteen-year-old daughter has opened a most enterprising tearoom. She has painted shingle signs and nailed them to trees on either side of the house, calling attention to the "Hillside Tearoom." In her old-fashioned parlor, with its painted floor, hand-braided rugs, and big fireplace, she has two little tables. And there, at any hour of the day or night, she serves coffee, milk, cream, buttermilk, tea, raspberry shrub, eggs in any form, doughnuts, and cookies. The farmhouse is old and in decay, but mother and daughter are clean, wholesome, and winning, and they will some day pay off the mortgage with the proceeds of their "buttermilk tearoom."

PRESERVING FRUIT FOR SALE

WHAT ARE GOOD FILLINGS FOR SANDWICHES?

See Volume VII, page 393.

WHAT FLOWERS CAN YOU CULTIVATE EASILY?

See Volume VI, pages 329–332.

EARNING YOUR LIVING

CITY opportunities and a large amount of money are by no means necessary in preparing to earn your living. Many of the most successful city workers have come from the country already trained. It is often the opportunity right in our home town or village which we are overlooking. In coming to the conclusion that there is no chance for you to learn to earn your living, have you considered these possibilities — telegraphy, nursing, housekeeping, governess work, store work, laundering? Each of these kinds of work can be learned in all but the smaller villages, and some one of them can surely be mastered even in the smallest. Let us talk them over one at a time.

TELEGRAPHY

For many years telegraphy was regarded chiefly as a "boy's job," but that is no longer the case. In the large cities there are quite as many young women as men acting as telegraphers. To be a telegrapher is to earn one's living in a somewhat monotonous way, but it is always responsible work and should, therefore, make a special appeal to earnest girls.

Every town which has a railroad station must have a telegraph operator, and most of you therefore have right at hand a possible teacher. If you make your plans carefully, you can become fairly proficient without leaving home. Inquire of your local operator what book you should purchase to get a full explanation of the Morse code. This will not cost you much more than a dollar. When you have secured such a book, learn the code thoroughly before bothering anyone to give you instruction. With your father's or brother's help you can rig up a rude telegraph machine on which to practice your dots and dashes. If you are fortunate enough to have an enterprising young brother whose time is not fully occupied in other ways, he can doubtless be prevailed upon to learn with you, and you can practice on each other. For about five dollars you can purchase a *bona fide* little telegraph machine with wires. But all that is necessary is something to practice on so that you can learn thoroughly the language of the mystic little ticking key.

When you have learned all that you can by yourself, go to some one of the telegraph operators in your town, explain what you have done, and ask him if he will give you some lessons. One way of helping yourself would be to get permission to sit in a telegraph office an hour of the busy part of the day, quietly listening to the messages that go ticking over the wires. Have paper and pencil with you, and, if it will be permitted, make a note of what you can understand.

So far as seems to you practicable, follow the advice of a local operator both in learning and in looking for a position. But always remember that there are many persons in every occupation who are dissatisfied and speak ill of their work. They will tell you that there is no money to be made in it, and the like. Always listen patiently to such tales, but do not be guided by them. You may not be able to get a position just the minute that you consider yourself a proficient telegrapher, and you may have to go out of your home town. But you certainly can get instruction at home, and after a little you can secure a position somewhere.

Speed and accuracy — especially the latter — are the ideals toward which you must practice in this work.

NURSING

It is sometimes said that there is absolutely no opportunity in the nursing profession for a girl who cannot get a diploma from a good hospital. This is not true, as many hundreds of women earning a comfortable living can testify. If you have good health, a cheerful disposition, and a love for nursing, do not let anyone deter you from taking up nursing for your life work, even if you cannot take a hospital course.

Go to your family doctor and tell him what you have decided to do and ask his coöperation. Tell him that you will help him in any way possible without expecting any remuneration. Be ready to go anywhere and do anything that he may ask you to and regard it as your expert

training which you are receiving free. Plan to do this free nursing for a year at least, but do not of course refuse remuneration in cases where you can consistently take it. The chief thing is to be willing to give your services as long as may be necessary in order to gain efficiency.

You will find from the first that you are in competition with hospital-trained nurses, most of whom will regard you as an interloper. Do not let this disturb you, for you may in time become as indispensable to the sickrooms of your community as they. Then, too, it should be remembered that the trained nurse will seldom work for less than twenty-one to twenty-five dollars a week and expenses. There are many families to which sickness must surely sometime come which cannot afford this expense. They must either get a cheaper nurse or go without. It is a great blessing both to the doctors of a community and to the families in moderate circumstances to have a nurse who will help out for ten dollars a week.

Many self-trained nurses average ten dollars a week above all expenses, which is more than many of the twenty-five-dollar-a-week nurses can boast of. The cases of prolonged but not acute ill health more often than otherwise fall into the hands of the self-trained nurse. Such cases are sometimes tedious, but they do not wear out the health of the nurse as the acute cases do, and one's opportunity for doing good is often greater. There are always opportunities for making warm friends, and thus one broadens one's interests. The self-trained nurse will also find all her experience useful if she is able at any time to take a short or long hospital course.

HOUSEKEEPING

Every kind of a town has some demand for assistance in housekeeping; that is, in taking charge of a home and seeing that things run smoothly. In a large city establishment, to be a housekeeper means to have charge of many servants and the entire running of the house. But most housekeeping is much more modest. It requires only what any young woman can gain with patience and love for her work. Years ago it was assumed that only a matronly person, or at least a woman no longer young, could attend to the running of a house. This idea has been exploded long since, and now the young woman competes with the middle-aged one.

It is not necessary to attend a domestic science school in order to know how to bake and dust. Any girl can learn all that she needs to know in her own home, but she must remember that she must practice up-to-date methods to succeed. The days of feather dusters have gone, fortunately for all of us, and no ambitious girl can hope to make good who sweeps in the old-fashioned dusty way and flirts the feather duster.

Remember that the watchwords of modern living are sanitation and proper food. There are papers and books in every library which give information on these points. You must make up in reading what the pupils in a domestic science school get in the form of instruction. Learn how to buy and to cook good, wholesome meals, how to keep a house neat and cheerful, and, above all, how to do this and keep strong and happy.

Often what will develop into a good housekeeping position will at first be offered you as simply "housework." Do not be foolish enough to let the matter of name keep you from earning your living and getting valuable experience in a wholesome manner. The business manager of a large woman's club in an important city began her career as a three-dollar-a-week housework assistant. She says that this experience was invaluable to her.

GOVERNESS WORK

Governess work means, not the teaching of arithmetic and reading to young children, as it once did, but assisting mothers in caring for their children. It is often called "mother's helper" work. The only qualifications are a love of children, an optimistic temperament, patience, and honesty.

A governess must be prepared to lead a somewhat lonely life; that is, she will be closely confined to the children and will not, therefore, have much time to cultivate friends. But she always has the opportunity of making friends with the family with which she works.

An experienced governess earns from six

to twelve dollars a week, clear of expenses. Some governesses earn as much as twenty-five dollars a week.

All that you need to do to secure a position as governess is to register with a *good* employment agency and to advertise in some good paper. You must of course have unquestioned references as to character and general qualifications, but actual experience is not necessary to secure a position. Do not go to a distant town or city to see about a position unless your father or mother or some older person can go with you. There is always the unfortunate possibility that an answer to your advertisement may have been sent by an evil person. Do not accept any position until you have looked into it thoroughly. You should demand references as well as the person employing you, if there is need of them.

STORE WORK

Here again we have a kind of work for which every town offers opportunities. It consists of bookkeeping, or clerking, or delivering goods. The last is seldom undertaken by young women, but there is no village or town store, whether it sells groceries, drygoods, or drugs, in which a young woman cannot make herself useful.

Often the time for making your start will be at the holiday season, when there is a rush of trade. Whenever your first opportunity comes, seize it eagerly, even if it is not what you want. Remember that in store work, as in everything else, one thing leads to another most unexpectedly. If you want a position in a drygoods store and the only opportunity that comes along is in a grocery store, take it by all means, and measure out vinegar and molasses as if that were the thing which you most wanted to do. If you "make good," the opportunity that you want will come to you.

In the first place, to get a position, apply in person to all the owners or managers of stores in your home town and perhaps in towns near by. Show them that you are in earnest, and they will remember you. When you have once secured a position, even if it is only a temporary one, keep your eyes and ears open to learn all that you can about the stock and the wants and whims of the customers. "Go slow" about making suggestions, but, when you see a chance to improve something, bide your time and at the right moment make your suggestion.

In no kind of work is it more essential that a girl should always wear an armor of dignity. Be pleasant and cheerful, but do not descend to chaffing and rude jokes, whatever the temptation. When drummers visit the store, you must establish pleasant relations with them, but let them know at once that you are in the store only for business. When you once gain their respect, you will have made helpful friends. Often they know of chances in stores in other towns and may help you to a better position.

LAUNDERING

Here again is a kind of work that has often been despised or underestimated. Laundering has come to be regarded as a science, and as such it is taught in domestic science schools. It is no mean accomplishment to be able to launder successfully dainty laces and delicate embroideries, as well as the more common articles.

Before you seek to do work for others you must learn all that you can about soaps, starches, cleaning powders, and similar things. When you feel sure that you know how to make garments clean and attractive, send out neatly printed cards or insert an advertisement in your local paper to the effect that you are prepared to do all kinds of light laundering at satisfactory prices. Never go out to do work; always have it sent to you. You will need the assistance of a boy in collecting and delivering your goods.

From the start, let your ambition be to make such a reputation for careful work that you can in time enlarge your activities and become the manager of a thriving little laundry. But begin modestly, and go slow. Do not make the mistake of despising common clothes; you cannot expect to have only laces and embroideries.

The dozen or more lines here suggested do not by any means cover the field of possible vocations for girls. These vary with home conditions and with town, village, or city needs. But the methods of one occupation are the methods of all. The girl who is on the watch for an opportunity and is willing to start in a small way will soon find her earnest efforts rewarded.

COLLEGE TRAINING — HOW THE POOR GIRL MAY GET IT

AN education is within reach of practically every boy and girl in this country. The days have gone when only families of wealth or even of moderate means could send their sons and daughters to college or to technical schools. Even poverty need not now stand in the way of ambitious young people. Determination, patience, health, and self-denial are all that one needs to open the way to a diploma. The girl who wants to earn her living at home will find the effort very much worth while.

A COLLEGE EDUCATION ON FIFTY DOLLARS

Several years ago a girl of sixteen left her home in a small New England town and asked admission at a large city university. She brought with her only a small, old-fashioned trunkful of clothes and fifty dollars in money. This money she had been several years in saving, and it represented all that she had in the world. It was just enough to pay her first term's tuition, and when the dean accepted her application for a scholarship he asked her how she expected to live. "Oh," she exclaimed unhesitatingly, "I am going to work my way through college." And she did. Every afternoon she went into a news-clipping bureau and pasted and labeled clippings at ten cents an hour. Then at breakfast and supper time she worked in a dining room, and for her services received her meals and a dollar a week. This dollar paid for her room rent, and the two dollars that she earned at the news-clipping bureau went for books, car fares, and incidentals. She was granted a scholarship each of the four years, so that she was able by the hardest kind of work and the most rigid economy to keep out of debt. Throughout all her college course she lived in a small bedroom which was heated only by the warm air from the hall, and almost never had a penny to spend on anything but the real necessities. One simple white organdie dress was her festive gown for all occasions, and this also did service as her graduation dress.

Few girls are as poor as was this girl, for none of her relatives could give her any assistance. But there are many hundreds of comparatively poor girls who enter college every year, and the numbers are increasingly large. Now, as never before, the door of opportunity is open to earnest, ambitious girls, whatever their social standing or their circumstances. But the way into and through college is not, and perhaps never will be, an easy one for the inexperienced girl who must rely wholly upon her own hands and brain to pay all her expenses. Little heartaches will come to her again and again as she realizes that she cannot belong to this club and attend that social because she has neither money nor time.

WHAT ONE GIRL DID

One girl went through the four college years eager and hungry for the companionships that belong to girlhood and to college life, but she reached graduation almost a stranger to her classmates. When she was not studying, she was working for her room and board. She was asked if she thought the struggle had paid, and the glow that filled her face was itself an answer.

"Yes, college was everything to me," she answered. "Of course I had dark little moments when I rebelled that some girls seemed to have everything and I had almost nothing. But I believe that no girl has ever gotten so much out of college as I have. While I could not actually take part in most of the pleasures that the others enjoyed as a matter of course, I always could 'make believe.' The parties that I have attended in my imagination, the long, make-up conversations that I have had at receptions with distinguished professors, would fill many books. And then I have had the greatest privilege of all — sitting elbow to elbow with girls of my own age and listening to the wisdom of our professors. I shared equally with the richest girls the privileges of the classroom. I was never morose. I always brought a cheerful face to my classes, and few of my classmates ever guessed what a battle of pennies my college life was. But it all paid a hundred fold."

WHAT THE GIRL WHO HAS NO ONE TO HELP HER SHOULD DO

Many girls have to pay all their own college expenses. When this is the case, it is wise to have earned money enough to cover at least the first year's expenses before entering college at all. It is the consensus of the opinions of those best qualified to pass on this matter that if a girl can see her way through one year of college, the rest will be comparatively easy. But the freshman year is the most arduous of the course, for everything is new and strange. The classroom methods, the ways of studying, are quite different from those of the high school, and the girl needs all her mental and physical energy to cope with the new life.

It is better to spend two years after graduation from high school in earning and saving money than it is to rush directly to college with empty pockets. And if, by some good chance, a girl can spend these two years in teaching a small country school, or as a stenographer in some business house, she is greatly helping herself to make the succeeding years easier. If she has taught school, she will be in a more receptive state of mind when she gets to college. This teaching experience will also be of great value to her if she plans to teach upon graduation from college.

The girl who enters college as an experienced stenographer is doubly equipped. She has the means of making her classroom lecture work absolutely accurate, and also an accomplishment which she can readily use in earning money for her expenses. A competent stenographer is always in demand, and especially one who holds a college diploma and in addition has had actual practical experience. Such a person can almost always step from college directly into an enviable position as secretary to some person or institution. It has often happened, as the dean of any college can testify, that the girls who have seemed to be handicapped in college by the necessity of having to earn their own living are the ones who have met with instant success upon graduation. Thus what at first seems a hardship may prove to be the means of winning success.

Much of the real pleasure of going to college is to be found in anticipating it and planning for it. Even if a girl is so hedged in by adverse circumstances that college seems impossible, she can have the pleasure of making believe that she will go sometime. It would be wise, both for the girl who wants to go to college and for the girl who is going, to decide which college is the best for her to attend, what course it would be wisest for her to take, how she would live at college, and the like. The first thing to do is to assemble the catalogues of the available colleges and study their contents. When these have been carefully examined, a list of questions which are not answered in the catalogues should be prepared and sent to the deans or registrars. In some colleges, while poor girls are not unwelcome, there are few opportunities for any girl to earn money during term time. Pains should be taken to learn just what opportunities there are in the different colleges for getting scholarships and for earning money. In general, an institution located in or near a large city is the best for a poor girl. She will usually be allowed to choose, subject to the approval of the college, her own lodging, and can find many ways of keeping down her expenses.

COLLEGE EMPLOYMENT BUREAUS

Many, if not most, of the universities now have an employment bureau, the purpose of which is to find work for needy students. A girl should make a specific inquiry as to such a bureau when writing to the dean for information, and should open a correspondence with the person in charge. Think out carefully just how much money a year's expenses will demand, and then consult with the employment bureau or with the dean as to what part of this amount you can hope to earn while in college. You will make a more favorable impression on the college and employment bureau authorities if you can name certain kinds of work that you can do. There are hundreds of needy students who apply for work and say merely that they "can do anything." This is not what is wanted. A person should be *willing* to do anything, but should be *fitted* to do some particular thing. Can you tend babies, amuse children, cook, sew, trim hats, use a typewriter, act as telephone operator,

or keep books? Think over your accomplishments, however humble and seemingly unimportant they may be, and see if some one of them cannot be turned to account in working your way through college.

THE HARPER

A college girl taking the part in outdoor dramatics.

DO ANY HONEST WORK CHEERFULLY

If the employment bureau informs you that there is a demand for a certain kind of work, learn to do that kind of work before you enter. It used to be the fashion for girls to look for tutoring positions, since this was supposed to be clean, high-grade work. The amount of tutoring work which an inexperienced college girl can now secure is almost negligible. Indeed, most of the tutoring, whether of high school or of college, is done by professional tutors who do this kind of work year after year. The only limits that a girl should set as to the work that she will do are those of respectability. Housework is perfectly honorable and will probably prove more remunerative and better for the health than office work or tutoring. Many a bright college girl has gone with a private household to work for her board and room and by her tactful personality and efficient endeavor made firm friends of her employers. One girl who worked in a home, as general housework helper, was taken in as one of the family, and occupied the same social position as the wife did. When the girl had finished her college work, the woman said, "I feel as if my sister were leaving me." One can never have too many friends — and especially is this true of the poor girl who has no home to fall back on. The surest way of making friends is to perform cheerfully and well whatever task is set before her. The college girl should not be above any honest work; and all honest work is worth doing well.

THE GIRL AND THE HELPER

Before making all her plans for college, a girl should look about her to see if there is not some person — a teacher, a clergyman, or a family friend — who can advise her in regard to the details of college work. There is always a possibility that such a person can interest someone in the college town in the girl, and thus make her early college days less lonely and formidable. No person should lean on the good will and helpfulness of another. Especially important is it for the poor girl to learn to stand alone; but the world is always ready to give a lift to the earnest girl who fears nothing, and she should expect this help and receive it gladly.

The advice that is so often given to young people is applicable here: *The world always respects and makes way for the person who knows where he is going; therefore start on your way eagerly and fearlessly, and the path will open up before you.*

MARY LYON AND EMMA WILLARD, PIONEERS IN WOMEN'S EDUCATION

SOME PHASES OF THE RELATION OF THE COLLEGE GIRL TO HER FUTURE VOCATION

By President Mary E. Woolley

WHAT should be the relation of the college girl to her future vocation is a question often asked, not only by the girl — perhaps even more frequently by her parents and teachers. The question indicates the long way traveled since women began to think of college training as a possibility for them as well as for their brothers. At that time the girl who entered upon a "career" was the rare exception; to-day, in hundreds of American homes, the vocation of the daughter is regarded almost, if not quite, as seriously as that of the son.

In discussing the relation of the college girl to her future work, three classes of students must be considered — first, the girl who expects to enter upon a vocation and knows rather definitely what it will be; second, the girl who looks forward to some vocation, but does not know what; third, the girl who has no expectation of "doing anything," in the common acceptance of that expression.

The first girl has the advantage of a definite goal; she knows in what direction she is going, or wishes to go, and is generally studious, making good use of her opportunities, since she has the inspiration of a purpose. Her dangers are narrowness, over-specialization, if she is in a college where that is possible, and a too utilitarian outlook, leading her to elect the courses which will play directly into her future work and to value the college course simply as a means to that end.

The second type of girl, the one who expects to "do something" but does not know what — and this girl, in most colleges, represents the largest number — has to meet a different kind of temptation, the temptation to lack of definiteness in her general course and of coherence in her elections, a tendency to scatter her energies, since one thing may be as useful as another in preparation for that indefinite "something" which the future, presumably, has in store for her. Diffuseness instead of narrowness, a little of everything instead of over-specialization in one thing — these are the pitfalls against which she must be on her guard.

Perhaps the chief danger confronting the third type of girl is the danger of losing sight of the real object of a college course — that is, the preparation for service, in the deepest and best sense of the word. No girl has a right to take the college opportunity and squander it for her own selfish pleasure. The wise girl, although the future may seem to hold no need of a paid vocation, will lay the foundations for a definite calling as earnestly as the girl who knows that the responsibility for her future rests largely upon her own shoulders. An intelligent American woman has no right to assume, whatever the privileges that position and wealth confer upon her, that she has no responsibility for service and therefore no concern as to the preparation which shall best fit her for that service.

To each girl definite advice might be given as to the best course for her to pursue in the light — so far as she has light — of her future vocation; but there are certain great, underlying principles which apply equally to every girl, and apply not only to her work but also to her life. The girl who is so fortunate as to have the opportunity of a liberal education utterly fails to improve that opportunity unless she gains from her college course two results, *efficiency* and *vision*. In all vocations, paid and unpaid, industrial and professional, the work of the hands and the work of the head — the call of the day is for greater efficiency. Superficiality is the bane of American life. The passion to attain results — position, fame, wealth, even culture — without painstaking industry; the value set upon the short cut to success; the lack of pride in work worthily done; the loss of interest in the achievement itself, irrespective of compensation or recognition — against this "drift" the college must take its stand.

The first essential to efficiency in any vocation is that which is essential to the stability of a building — namely, a good foundation. The required work in the curriculum often seems to a student nonessential to the subject in which she wishes to specialize, a waste of time, something to be finished and put one side as quickly as possible, that she may be free to follow her special interests. In her impatience she forgets or fails to realize that the reason for the requirement is the experience of generations of scholars that certain studies make good foundation material. The man about to build a house would be thought insane if he insisted that bricks, stone, and concrete should be discarded and clapboards substituted for the foundations, because, forsooth, the house itself was to be clapboarded and the roof shingled; or should demand that the foundations be omitted, that the house might go up the more quickly. The result would be a *shack* for fair weather, not a *house* to stand the strain and stress of all seasons.

In the laying of foundations, workmanship as well as material must be taken into consideration. The best quality of bricks may be so carelessly laid that the foundation is not only an offense to the eye but also a menace to the structure. Many a college graduate would give years of his later life if he could have once more the four of his undergraduate course, to live them more earnestly and to do his work more thoroughly. Would that the advice given to Timothy were taken to heart by every undergraduate, "Study to show thyself approved unto God, a workman that needeth not to be ashamed"!

What does the workmanship of which one needeth not to be ashamed imply? First, thoroughness, something more than the preparation which will insure a creditable appearance in the classroom or passing marks in examinations. It means a habit which will be content with nothing less than mastery of the subject; not exhaustive knowledge — that does not come within the province of the undergraduate — but what may be called a mental grip. To gain this power of *gripping* a subject, this habit of absolute accuracy, of exactness, of retention of the essentials, is more valuable as preparation for whatever one may plan to do than any amount of technical training without it. And in addition, it is invaluable for the unexpected demands of life — those demands which come unplanned and unprepared for.

There is a peculiarly close relation between the acquirement of this power and that part of the curriculum commonly regarded as difficult. Difficult courses, the difficult places in a course, will be welcomed, not avoided, by the student who wishes her college training really to be a training, not only for her future vocation, but for her life. Grappling with difficulties

develops mental and moral muscle, the kind of muscle that the modern world needs for the solving of its problems. Flabby mental muscles are a handicap in any vocation, and it is only by strenuous exercise that they can be strengthened. The easily learned lesson, the course that requires no effort, that encourages mental loafing, are not only no preparation for the world's work — they are actually a hindrance, since they form bad habits. When a course is "dead easy," beware of it! The present-day girl who wishes to become an efficient woman studies her physical self to see what needs to be corrected and strengthened, and adapts her physical exercises to that end. There is equal reason why she should study her mental self and see what *it* needs for its best development.

The attempt to master the difficult gives training in concentration, most valuable of all mental habits. The student who can shut out the world and be conscious only of the problem to be solved, the thought to be interpreted or expressed, has learned one of the inner secrets of success in whatever she may undertake.

How far should the college of liberal arts make it possible for the undergraduate to prepare herself directly and definitely for her future vocation is a question calling forth such widely divergent views that one approaches it with a sympathetic understanding of the negro preacher who, when asked by a white neighbor, concerned for the ethics of his colored brethren, whether he would not preach on the Ten Commandments instead of choosing abstruse points of doctrine, answered firmly, "No, sah! Dat would breed a coolness in de congregation."

The value of thorough vocational training can hardly be overestimated. Whatever the calling, the more thorough the technical knowledge, the greater the chances of success. The debatable question is, how far is it wise for the college of liberal arts to attempt to meet this need and for the student who has the opportunity of a liberal education to give it the vocational bias. In this, as in most discussions, it is possible to take an extreme position on either side. The fact that a girl looks forward to a certain vocation and plans her course with reference to it gives definiteness and earnestness to her work. And for the girl who has no particular vocation in view, but who wishes to fit herself for some part in this work-a-day world, the thoughtful shaping of her course, that it may give her a certain mastery in some direction, is invaluable.

The solution of the vexed problem is to be found in general principles rather than in the laying down of fixed rules. The mission of the college of liberal arts in common with the vocational school is to develop *efficiency*, the ability to do and to do well. But that is only half its mission — it is also to give *vision*. To minimize this opportunity in order to offer strictly vocational courses is a mistake from the point of view of the vocation as well as of life in its larger meaning.

"The offer of the college" President Hyde defines in part as follows: "To be at home in all lands and all ages; to count Nature a familiar acquaintance and Art an intimate friend; to gain a standard for the appreciation of other men's work and the criticism of your own; to carry the keys of the world's library in your pocket, and feel its resources behind you in whatever task you undertake."

In other words, a liberal education gives the power of vision into the past and into other sorts and conditions of life; into the world of Nature and into the world of Art; into the best of what men have thought and said and done, and left as an inspiration for those who come after them.

To know how to do and to do well is essential in every vocation, but in every vocation what the worker *is* counts as truly as what he is able to *do*. A liberal education rightly appreciated and improved makes a bigger human being, enlarges the resources, broadens the outlook, deepens the sympathies, quickens the senses of responsibility. To the question, "How can I be best fitted to do my own work?" it adds the larger question, "How can I be best fitted to do work for others?"

BOY BLOWING SOAP BUBBLES

WHEN WERE GLOVES FIRST WORN?

GLOVES, or, as the Germans call them, "hand shoes," date back surprisingly far in history. Laertes, father of Ulysses, is described in Greek legend as wearing gloves when farming to protect his hands from thorns. Xenophon scoffs at the Persians as effeminate because they covered their hands with gloves. In the Middle Ages they were a common article of dress. Kings and nobles always wore them as part of their court costume. They did not consider their dress complete without long, thick gloves which were richly embroidered in gold or studded with precious stones. The ladies of the court also wore beautifully decorated gloves. We are all familiar with the custom by which a knight wore his lady's glove on his helmet as a mark of his allegiance to her and as a token of her gracious favor shown to him. The gloves which knights wore in combat were gauntlets of mail. To throw one down was the common way of challenging to a duel.

HOW ARE GLOVES MADE?

The making of a leather glove is an elaborate process which, like most other industries of this nature, has been much simplified by recently invented, ingenious machinery. Gloves are made principally from the skins of goats and kids, sheep and lambs, deer, dogs, and antelopes. The skins are prepared very carefully in order that they may retain their softness and pliability. For what are known as "dressed kid" gloves there is a special preparation of flour and yolk of egg which gives a particularly soft finish.

The leather is stretched and measured, and then "pulled down" to a dimension which will make it right for the size of glove for which it is intended. These sizes are usually scaled in men's or women's dress gloves in quarter sizes, and each size has a certain amount of leather pulled into them, so that when they are put on the hands they will stretch or open up to the proper size. After the piece of leather is properly pulled and measured, it is set aside and punched out with cutting dies. These dies are made with great accuracy. It will be noted that except for the pulling or stretching of the leather to the proper size or shape, there is no hand work in the cutting of the gloves.

Gloves are stitched on sewing machines of various types. Even for hand-sewn gloves a vise with minute teeth is used to regulate the stitches. When the gloves have been sewed together, they are often beaten in a damp cloth to make them soft.

WHEN AND WHERE WAS PAPER MONEY FIRST USED?

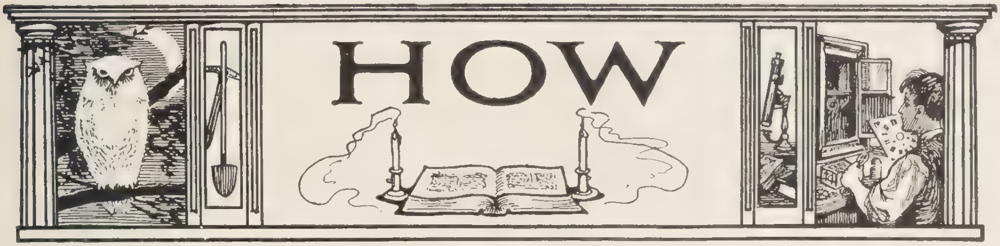
Probably in China, where it was found as a common medium of exchange by Marco Polo, in the thirteenth century.

WHEN WAS PETROLEUM DISCOVERED?

See Volume IV, top of page 6.

WHEN WERE MUSTACHES FIRST WORN?

When the Moors were being driven out of Spain (1300–1492), many of them became converts to Christianity, but in the encounters between the Spanish and the Moors it was impossible to distinguish the Christian Moors from the Mohammedans. To avoid mistake, the Christian Moors decided to shave their beards, all but a goatee, or chin beard, and let the hair grow on the upper lip, thus suggesting a cross. Mustaches have been worn ever since, except when fashion decrees a smoothly shaven face.



HOW ARE DOLLS MADE?

ALTHOUGH many dolls are manufactured in America, especially since the Great War of 1914, most of them have come from Germany or France. They are made of papier-mâché, bisque, porcelain, china, celluloid, wood, and what is called "composition," that is, a preparation made from different materials. The wooden ones are carved by hand by German peasants, who work very cheaply and seem to have a knack for doing this sort of work. Sometimes a whole village will have for its chief trade the making of dolls and toys. In the village of Sonneberg, in the Thuringian Forest, Germany, the making of dolls has been the chief industry since the seventeenth century. Our story is of the dolls which are made in factories in large quantities.

Dolls of papier-mâché, bisque, composition, or porcelain are all made upon the same general principle. The model for the head is fashioned out of a piece of soft clay. When the head has been modeled by a skilled workman, a cast is made of the face and then of the back of the head. This done, a pulp of plastic papier-mâché is pressed inside the clay casts, great care being taken to force the material into every curve and depression of the cast. Then each half of the mold is taken out and the two parts are glued together to form the complete head. This papier-mâché head, however, is of colorless gray. The next step in the process is to cut off the top of the head and set the eyes in place. If they are immovable they are glued in; but if they are to open and close, they are adjusted on wires with weights attached. The top of the head is now glued on again. The process now varies according to the material used, the heads being dipped in a melted preparation of the bisque, composition, porcelain, etc. Cheap dolls are dipped only once, but the more costly varieties are coated several times. The doll then goes to artists who tint the face. Each of these men has his own specialty. Some color the lips; others, the eyebrows; others, the cheeks; and still others, the nostrils. A tight cap of net is next glued to the head, and to this the hair is sewed. Some dolls have real eyebrows and eyelashes instead of painted ones. If so, these are put on at the same time as the hair. If the doll is of china, the hair is painted on when the face is made.

Next comes the body. If it is of kid or of cloth, it is turned out by machinery and stuffed. Dolls were formerly stuffed with sawdust and hay, but now curled hair is used for the best dolls to make them light. Cork is used for what are known in the trade as "featherweight" dolls. Sometimes the bodies are of papier-mâché, sometimes of bisque, and often of "composition." One of the secrets of doll making is the manufacture of this "composition." Some of our best dolls come from a man in the village of Sonneberg who has invented a particularly successful kind, the secret of which he has divulged to no other person. It is feared that when he dies the secret of this particular make will die with him. Most of our dolls nowadays have jointed bodies, the process varying from that of casting an entire body only in making the parts separately and then stringing them together. When the body and head are fastened together, the doll is ready to be dressed.

HOW LONG AGO DID LITTLE GIRLS PLAY WITH DOLLS?

At least four thousand years ago, for in Egyptian tombs which cannot have been opened for four thousand years we find dolls, carefully carved and painted and nicely dressed, lying next the mummies of their little mistresses. It is said that the oldest piece of sculpture ever dug out of the earth was a carved doll.

WHAT INSECT CARRIES ITS BABIES IN A VALISE?

THE cockroach lays sixteen eggs and carries them about with her in an egg case shaped like an old-fashioned valise. When the mother feels the little ones stirring, she rips up the valise, lets out the babies, and then, with true economy, eats up the empty case.

WHICH HAS MORE ENERGY IN PROPORTION TO ITS SIZE, A BIRD OR A MAN?

A bird is said to have five times as much energy as a man. It is this energy that enables birds to fly for many miles without rest or food. (See Volume XI, color picture, "Going South," between pages 290 and 291.) In order to keep up the supply of heat, birds need to eat a great deal in proportion to their size.

WHAT IS WHITE COAL?

"White coal" is a name given by the French to water power, because it is taking in such large measure the place of steam power supplied by the burning of coal. The force of falling water drives gigantic water wheels and produces hundreds of thousands of horse power in electric current and other forms of energy. All over the world men are harnessing rivers and making use of the power which was formerly wasted.

WHAT HORSE POWER DOES NIAGARA FALLS SUPPLY?

See Volume II, page 78.

WHAT IS A WHARF?

Any landing place for vessels and their cargoes. A pier is a projecting wharf; a quay is a wharf parallel with the shore; a jetty is a structure of wood or masonry, projecting into a stream, serving as a wharf or pier, and also as a wall to protect the shore or divert the current of the water.

WHAT IS A DOCK?

An artificial basin for vessels; also the space between two adjoining piers or wharves, often roofed over and used for storage.

WHAT BECOMES OF SEA WATER AT LOW TIDE?

It goes back to its natural level. High tide is a great wave drawn shoreward by the combined action of the earth's rotation and the attraction of the moon. The subsiding of the wave is low tide.

WHAT IS THE ORIGIN OF THE BARBER'S POLE?

Once the barber was not only a haircutter, but something of a dentist and surgeon. When bloodletting was the common cure for ills, the barber was the man to go to, and in his shop he kept a small pole which the patient grasped in order to make his arm tense. This pole was set in the window for a sign when not in use, and naturally a red pole, to signify the blood, with white stripes for the bandages, came to be permanently placed in front of the shop. In its day the barber's pole explained itself.

WHAT DOES THE PHRASE "CATCH A TARTAR" MEAN?

An Irish soldier in the imperial service, in a battle against the Turks, is said to have shouted to his comrade that he had caught a Tartar. "Bring him along, then," said his mate. "But he won't come," cried the soldier. "Then come along yourself," said his comrade. "Arrah, I wish I could, but he won't let me!"

BEHIND THE SCENES

IN A DEPARTMENT STORE

ALTHOUGH it had its beginning in the mere consolidation of a few small shops, the modern department store is a highly complex organization, with ramifications extending to the ends of the earth and an annual volume of business amounting to millions of dollars.

A. T. Stewart was really the father of the department store in this country. As early as 1860 he erected a building on Broadway, New York, which cost over two million dollars and where the diversified merchandise of a score of small shops was gathered under one roof. That building is still standing and is occupied by John Wanamaker, who, however, has built another and larger department store on the next block. Wanamaker, with his original store in Philadelphia, and Marshall Field in Chicago, were among the merchants who early realized the unlimited possibilities of the department-store idea. Their foresight made them millionaires many times over.

Of late years a new kind of department store has come into existence, the mail-order store. Although it carries a tremendous and wonderfully varied stock, the selling is wholly by mail and is stimulated by means of a catalogue as large as a dictionary. The first letter to be opened by the mailing clerk may contain an order for a toothbrush and the next for a steam-heating plant or a keg of nails. With the increase of postal facilities this business has developed to enormous proportions.

HOW ARE THE STORES STOCKED?

Perhaps there is no better way to learn what goes on behind the scenes in a big store than to spend a day with the buyers in New York and then to follow the goods they have ordered until they are sold over the counter. The buyers work under the supervision of the merchandise manager. They are men and women of long training and wide experience. Oftener than not they are graduate clerks. They hold their positions because they are shrewd, keen, and resourceful. To be known as, perhaps, the best buyer of hats in the country is to occupy no small niche in the mercantile hall of fame.

Much of the buying for stores all over the country is done in New York; yet representatives of every big shop make periodical trips to Europe. Paris sets the fashion in women's apparel, while London decrees what men shall wear. Usually these cities are just a year ahead of the United States, whose merchants are quite willing that this should be so. Only those styles which stand a season's test abroad are adopted and offered in this country.

New York, however, is the great buying center for miscellaneous merchandise. The larger stores in all American cities have New York offices, where salesmen from hundreds of manufacturing establishments meet the buyers, usually by appointment, at nine o'clock in the morning. The salesmen show samples, discuss new lines, and solicit orders. Some sales are made in this way, but the enterprising buyer usually gets away as soon as possible and visits the headquarters of the manufacturers down town. There, instead of asking, "What have you to show?" he is more likely to say, "Can you make this or that for me?"

WHAT SHALL THE BUYER PURCHASE?

Before he leaves his store, the buyer has a fairly accurate idea of what it ought to sell. His perception of what the public is going to demand is little short of intuition, but it is reenforced by the results of many conversations with the store clerks, who are quick to sense the desires of their customers. The buyers from similar departments in two stores may place entirely different orders, for the reason that they may live in cities which are widely apart, or come from stores which make their appeals to different classes of trade.

In former days, buyers purchased goods for several departments. Now, in the more highly organized modern store, there may be several buyers for a single department. One of them, for example, may buy only silk or lace waists, while another may purchase only cloth waists. There may be a dozen or more buyers for the department devoted to women's apparel. Each of them is glad to consider novelties and specialties, but they know pretty clearly what they want when they start out, and they order accordingly.

A good buyer must know what every manufacturer in his line all over the country is doing. He must not place a large order where it cannot be filled in a specified time or where there is likely to be any question as to quality standards. The buyer himself must know his line so well that he cannot be deceived for a moment on the matter of quality. He cannot afford to make a mistake, for his order may be large enough to consume the entire output of a factory running steadily for a year.

Let us consider that the buyer has now finished his work and has returned to his store, perhaps in Pittsburgh. Soon after, sample goods arrive and are carefully examined to make sure that they correspond to specifications. The extent to which quality is guarded in high-class stores may be judged from the fact that oftentimes goods are sent to a laboratory and submitted to the acid test before they are offered the public. A well-managed store takes no chances of putting inferior goods into the hands of its customers.

Finally the big shipments begin to come and are piled in a storehouse, which may be a detached building. As the goods are unpacked another careful examination is made. Then the buyer, in consultation with the merchandise manager, indicates the prices at which they are to be sold.

The "mark-up," as the process of price fixing is termed, is not a hit-or-miss matter, but is effected mathematically, on a basis of original cost, overhead charges, and the perishability of the goods, with a definite percentage of profit.

HOW ARE THE GOODS SOLD?

Now the newly purchased goods are ready for the counter, but they must find their way thither before or after store hours. The store manager will insist that every department be in perfect order when the first customer arrives and that every clerk is at attention until the doors are locked at night.

The next move is to make the clerks familiar with the new goods. Usually our ubiquitous buyer calls them together in the morning and gives them all the help he can. A good clerk is supposed to be able to answer almost any random question which a customer may ask about any article which is being shown.

It will be interesting to consider the clerks for a moment. Probably we shall find that they constitute a more intelligent and better educated class than a few years ago. The tendency is to pay them more and to make their lives easier; yet the records of the investigation held by the government in New York in 1913 were much less flattering to store owners than might have been wished or even expected. They showed that distressingly low wages are paid many of the girls and that welfare work is often looked upon with disfavor, even where perfunctorily carried on.

There are some stores, however, where conditions are very much better, and where eight dollars a week is the minimum wage, even for bundle girls. In such stores every clerk is expected to have had at least a high-school education; and not a few college girls are enrolled, who are convinced that they have taken the right road to a successful business career.

With the goods upon the counter and the clerks in their places, the day's business begins; with a rush, perhaps, if there are bargains advertised, but otherwise slowly, with an increasing volume as noon approaches.

In many of the better stores the clerks are allowed to sit down at times, but for the most part they are kept busy. If there are no customers, the stock may need rearranging, and there are always points about the goods to study. A successful clerk is alert, good-humored, and courteous. She can often distinguish between a probable purchaser and one who is merely "looking"; but the latter should get as careful attention as the former, for the "looker" is certain to be a purchaser some day.

The clerk is quick to catch the comments of customers and to note their attitude toward the goods displayed. Both may be talked over later at a store conference. If a customer asks for something which is not in stock, the clerk makes a note of the fact and sends it in duplicate to the department buyer and the store manager. It is for them to explain its absence. If the stock begins to run low in any line, a note is made of that fact. A department-store buyer feels himself at fault when he hears a clerk say, "We are just out, madam, but we have some ordered."

In a modern store the clerks are instructed in the principles of salesmanship, possibly even in its psychology. They learn that "Is there anything I can show you to-day?" suggests doubt, but that "What may I show you?" is a positive form of persuasion to which the possible customer is more likely to yield.

FINDING OUT ABOUT OTHER STORES

Now the buyer has done his best, and the goods are selling (it is to be hoped); but the general manager is not satisfied. He cannot help wondering what the other stores are doing, and quite naturally he sends out scouts to ascertain. These people are termed "shoppers." Every store has a corps of them. Each competing establishment is visited at frequent intervals, and purchases are made in the regular order of business, the shoppers not being known to the clerks. Then very complete and illuminating reports are made out and submitted to the general manager. They may read somewhat like the following:

The John Smith Co.

Report of Shopper No. 9.

Peter McNeil's. Lace collars. $3.00. 10 to 11 [o'clock]. 10 [purchasers].

Not equal to ours at the price.

New York Store. Lace collars. $2.50. 11 to 12. 30.

Quite as good as ours and in greater variety.

Rice & Andrews. Lace collars. $3.50. 1 to 2. None.

No better than ours at $3.00.

While this shopper, representing the John Smith Co., has been making her rounds, shoppers from the other stores have been doing the same kind of reconnoitering, and it is safe to say that there will be a readjustment of collar prices in the shop of Rice & Andrews next morning.

HOW IS THE ADVERTISING PLANNED?

"Frequent and constant advertising brought me all I own," wrote the millionaire, A. T. Stewart. His successor, John Wanamaker, has said, "I would as soon think of doing business without clerks as without advertising." Gladstone voiced the same thought in a phrase as trenchant as it was witty when he observed, "Only a mint can make money without advertising."

As may be inferred, therefore, the publicity manager of a department store holds a responsible position. He must know how to set forth the store's peculiar shopping advantages and to present the special inducements which it offers in such language that the public's collective eye will be caught and its interest, cupidity, or curiosity aroused. It makes no difference what bargains the store may offer or in what manner it may cater to the pleasure and comfort of its patrons; unless great numbers of people are persuaded to enter its doors, nothing is gained.

No advertising campaign can succeed unless justified by what is actually shown in the shop; but very much depends upon the way advertising is written and illustrated. Of two advertisements, filling exactly the same amount of space in the same paper, one may bring twice as much trade as the other. Advertisement writing has come to be little short of a fine art, and there is no better advertising than that done by some of the department stores in our large cities.

In the average establishment it is the plan of the publicity manager to walk about the store, ascertain what special sales have been decided upon, consider stock which has just arrived, keep the weather and the season in mind, and prepare his copy accordingly. Most department-store advertising is in newspapers. The total cost for a single store may amount to $300,000 or more a year.

ARE SPECIAL SALES GENUINE?

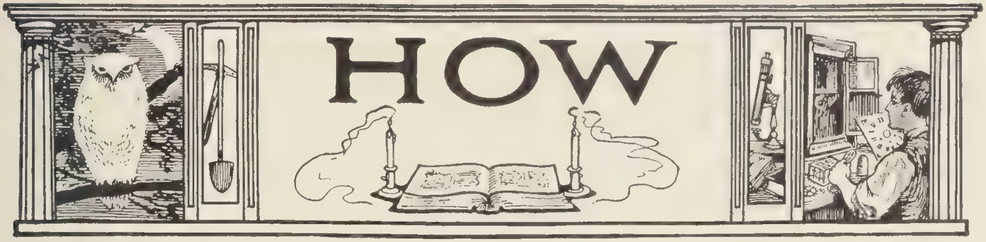
All department stores make a feature of special sales at which goods are advertised as at greatly reduced prices. Some of these sales are impositions, for the few goods actually offered run out of stock before the store has been open half an hour. In the more reliable shops, however, the advertised bargains are real bargains, offered to stimulate trade, because of an overstock of a particular line of goods, or for any one of a dozen reasons.

The bargain basement is a new feature of many stores. Such a basement may be fed from the regular departments, or it may have its own buyers and be operated as a separate establishment. In it are collected goods of many kinds which are secured through unusually advantageous circumstances from a manufacturer's overstock, at a bankrupt sale, from a maker who needed money in a hurry, or from a retailer going out of business.

The automatic bargain basement is a still more recent conception. When goods have been in stock a certain number of days, the price is reduced a fixed percentage without discussion. After a certain period another cut is made, and a little later a third reduction occurs. Then, if any goods remain at the end of a month, they are given to a charitable institution.

WHAT IS WELFARE WORK?

Many department stores have taken up what is known as welfare work in an endeavor to promote the health and comfort of their employees and thereby obtain a greater degree of efficiency. Rest rooms, restaurants where food is sold at cost, sanitary bubble fountains, lockers, and a welfare secretary, who acts in the capacity of an intermediary between the firm and its employees, are now found in a large percentage of department stores in this country. Often, too, there is an employees' association, which conducts dances and other social affairs. Nowhere is there more need or opportunity for helpful social relations than between shopper and clerk, and clerk and employer. The conditions which are being established in their department stores are greatly to the credit of some of our progressive business men.



HOW HIGH IS GIBRALTAR?

AT the highest point, 1439 feet. The name is formed from the Arabic words "gebel al Tarik," meaning "height or rock of Tarik," referring to Tarik Ibn Zeiad, a Moorish pirate, who built a fortress there in the eighth century and used the rock as headquarters from which to raid ships passing through the Strait.

HOW CAN THERE BE HOT SPRINGS IN ICELAND?

Part of Iceland is of volcanic origin, and in several of the mountains eruptions have occurred within the last four hundred years. In the southwest, in particular, there are many hot springs, over which food can be cooked.

HOW LONG WOULD IT TAKE TO COUNT A BILLION?

Many years. Working twelve hours a day, and counting at a rate of one per second, which is fast counting when large numbers are reached, a person could count 43,200 in a day, or leaving out Sundays and a fortnight for a well-earned vacation, just under thirteen million in a year. Sixty to seventy years would thus be required.

HOW IS PILLOW LACE MADE?

Pillow lace is made with bobbins carried back and forth to form a pattern

AN ANCIENT PICTURE RECORD ON A CLIFF

STORIES ABOUT WORDS

To take a word and trace it back as far as we can toward its beginning is one of the most fascinating employments in the world. Words, spoken or written, make up a large part of our daily life, and yet how many of us ever stop to consider how many words we use, where they came from, or how they came to be written in the letters of the English alphabet?

Of the hundred and fifty thousand or more words in the English language, most of us use less than four thousand. It is an interesting study to keep a record from day to day of the words in the vocabulary of a child who is just beginning to talk, and watch the number grow from fifty to one hundred, three hundred, and five hundred. It is also an excellent plan to watch yourself, and see how few words you use, and follow out for a time Professor Palmer's wise advice to add a new word to your common vocabulary every week. But to make this a pleasure and not a burden, one must go back a little in the story of words.

WHO INVENTED WRITING?

No one knows when man first began to record ideas by signs or marks, or whether picture writing, that is, drawing a crude picture of the object of which you wished to convey an idea, or sound writing, that is, making a mark to indicate a certain sound, came one after the other, or both together, or one in one tribe and one in another. In the picture at the head of the page we have picture writing on a cliff in our own country; on page 302, Volume I, picture writing as it was done on a smooth surface like paper; and on page 320, Volume V, two Chinese characters from that elaborate language with more than seventy-five hundred word signs. Our alphabet comes from the Latin, which in turn had its beginning in the Phœnician, while its name comes from the names of the first two letters in the Greek alphabet, *alpha* and *beta*.

WHERE DID OUR WORDS COME FROM?

After every new word in the dictionary [in brackets] you will find given the words from which it came, and in that record of its source, or derivation, there is more often than not a story, if you will but look for it. Take the word "lunatic." [Latin, *lunaticus*, fr. *luna*, moon.] Reading on, we find that this word was

applied originally to persons with that kind of insanity which is interrupted by lucid intervals. The duration of these periods was supposed in ancient times to be affected by the changes of the moon. So a lunatic is literally a "moon-struck person," and hidden in the word is a record of the Roman theory as to insanity.

WHAT IS THE ORIGINAL MEANING OF "BANKRUPT"?

Broken bench, from the Italian *banca rotta*. When Italian merchants, long ago, kept their wares on benches in the market place, if one of their number failed to pay what he had promised, they broke his bench in pieces and drove him off, to show the people that he was unable to meet his obligations.

WHAT IS THE MEANING OF "A 1"?

It is a shipping term, meaning first-rate. The character of the ship's hull is designated by letters; of the anchors, cables, and stores, by figures. Thus, "A1" means all first-rate; "A2" means hull first-rate, but furniture second-rate.

WHAT IS THE DIFFERENCE BETWEEN WORDS DERIVED FROM SAXON AND FROM LATIN AND GREEK IN OUR ENGLISH LANGUAGE?

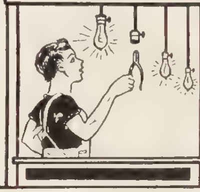
The Saxon words are more direct and forcible, and as a rule shorter, as the following examples of synonyms show:

Saxon	*Latin*	*Greek*
Starry	Sidereal	Astral
Speech	Language	Dialect
Saw	Proverb	Aphorism
Wayward	Erratic	Eccentric
Aim	View	Scope
Guess	Conjecture	Hypothesis
Curse	Malediction	Anathema
Stress	Accent	Emphasis
Foe	Opponent	Antagonist
Tale	Novel	Story
Pithy	Concise	Laconic
Trick	Artifice	Stratagem

WHERE DO WE GET THE EXPRESSION "PAN OUT"?

From the miner, who washes his dirt in a pan, watching the heavier particles go to the bottom and finding how the gravel "pans out."

IF



IF you want to act charades, here are a few good words to begin on. (See also Volume VI, page 283.) The word you choose may have two, three, four, or even five syllables. The *whole* word can be acted in two ways. Take, for example, the word *misrepresentation:* the first part *miss;* the second, *represent;* the third, *station.* (1) Each syllable may be a totally distinct scene from the other two, the whole word making a fourth scene. (2) The three syllables and the whole word may be the four scenes of a little story—all bearing on the word *misrepresentation* and being connected with each other. The first way is the easier of the two.

GOOD WORDS FOR CHARADES

Mistake (miss-take).
Mendicant (mend-i-cant).
Dramatic (dram-a-tick).
Knighthood (night-hood).
Boredom (bore-dumb).
Outrage (out-rage).
Pilgrim (pill-grim).
Independent (inn-depend-aunt).
Ireland (ire-land).
Phantom (fan-Tom).
Bandage (band-age).
Cockade (cock-aid).
Pil-fer (pill-fur).
Season (see-sun).
Vestry (vest-try).
Mischief (Miss-chief).
Jewel (Jew-ill).
Banquet (ban-quit).
Mistletoe (Miss-sell-toe).
Militant (mill-it-aunt).
Champagne (sham-pain).
Herring (her-ring).
Humbug (hum-bug).
Misfortune (mis-for-tune).
Ingratiate (in-gray-she-ate).
Spellbound (spell-bound)

TO ACT THE WORD "SAUSAGE"

I. *Saw.* A farmer's wife is cooking, when a shabbily dressed man knocks and asks for something to eat. She says "No," but the man persists and finally she tells him that if he will saw wood for an hour she will give him a hot meal. This he starts to do.

II. *Sage.* A man in dressing gown and slippers, skull cap, wearing spectacles and looking as wise as possible, is reading intently in a huge book. Books, charts, papers are all about him.

III. *Sausage.* The tramp of Scene I is eating in the farmhouse kitchen a plateful of potato and sausage. When the farmer's wife is not looking, he wraps up one sausage and puts it in his pocket. As he is going out of the door, the sausage falls from his pocket to the floor.

SOLUTION TO "THE OPEN DOOR" (page 104)

The prisoner who is placed in the cell marked *A*, and is promised his liberty if he can reach the door at *X* by passing through all the cells, entering each once only, gains his freedom by passing from *A* to the cell below, and thence *returning* to *A*, and leaving it again *by the other door;* his further course takes him up and down for the first two rows and across and back for the rest.

SOLUTION TO "THE DANGEROUS PRISONERS" (page 104)

The simplest way of rearranging the prisoners is as follows: 1, 2, 3, 1, 2, 6, 5, 3, 1, 2, 6, 5, 3, 1, 2, 4, 8, 7, 1, 2, 4, 8, 7, 4, 5, 6. As there is only one vacant cell at any time, the numbers indicate which prisoner is moved therein.

SOLUTION TO "A TRICKY COURSE" (page 105)

To trace this course draw lines upon the diagram from square 46 to squares 38, 52, 55, 23, 58, 64, 8, 57, 1, 7, 42, 10, 13, 27, and 19. This gives fifteen lines which pass through every square only once.

SOLUTION TO "LEAPFROG" (page 105)

Move 9 to 13, 3 to 9, 7 to 3, 22 to 7, 18 to 22, 24 to 18, 9 to 24, 13 to 9, 7 to 13, 3 to 7, 18 to 3, 22 to 18.

WHAT IS THE TOUCH SYSTEM OF TYPEWRITING?

IT is an interesting fact that the "Universal Keyboard" adopted in the early days of the typewriter has held its own against all suggested improvements and is still in practically "universal" use on all the standard makes of typewriting machines. This is probably due to the fact that this keyboard was invented by men familiar with printing, who knew which letters were most frequently used and were thus able to locate them on the keyboard according to a scientific scheme of frequency and convenience.

The letters are so arranged that those which are used most frequently in combination with others in forming the common words and phrases are struck by the first finger, the finger having the greatest strength and flexibility. There were formerly two types of keyboard used — the double, having a set of keys for the capital letters and another for the lower-case letters; and the single keyboard, where it is necessary to touch a shift key located at the side of the keyboard and hold it in place while the capital letter is being printed. The use of the touch system has, however, practically eliminated the double keyboard. In all schools the single keyboard is used, and a person going from one end of the country to the other will find himself familiar with the keyboard and manipulation of any make of machine likely to be placed before him.

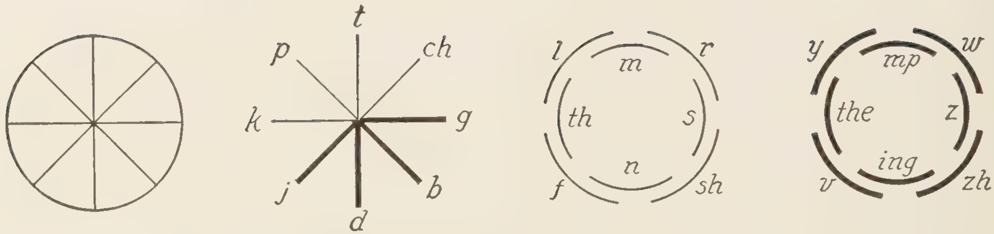
The touch system of writing means that the operator can look at the notes he is transcribing and does not have to watch his fingers to see that they are going to hit the key he desires. He memorizes the keyboard so thoroughly that he can write as easily in the dark as in the light, provided he is writing original or memorized matter and does not have to refer to notes. The process of acquiring perfect familiarity with the keyboard is more or less slow, but it is well worth the time and labor spent upon it, for once learned it is never forgotten.

The first step is to take the row of letters *a, s, d, f, g, l, k, j, h*. Begin by placing the little finger of the left hand upon *a* and strike each letter with a firm, even stroke, keeping the little finger of the right hand on the *semicolon* or the *colon*, depending upon the make of machine used. (There is a slight difference in the arrangement of the figure and punctuation marks upon the various machines using the Universal Keyboard, but the difference is so slight that a student soon overcomes the habit of using one arrangement when he gets at work on a new machine.)

The space bar should be struck with the thumb, using the right thumb when the word ends on the left side of the machine, and the left when a letter on the right-hand side closes the word. Keep the fingers over the keyboard and practice taking the hand off and putting it down on certain keys without looking. It is this kind of concentrated practice that soon makes the student familiar with his keyboard, and once that is thoroughly learned it is quite easy to go on doing things in a neat, businesslike manner.

The chief idea is to learn one row of keys at a time, and then make all the words one can think of from the letters in that line. Then take the line *q, w, e, r, t, p, o, i, u, y*, and lastly learn the lower line, the one next the space bar. For ease in finding the different letters the sentence, "Pack my box with five dozen liquor jugs," is recommended, as it takes in all the letters of the alphabet. After that, short sentences running the length of the line, written a large number of times, will help in getting up speed.

To the trained operator the method of the amateur of striking the same key with different fingers at different times is almost shocking. From the beginning he has learned which finger should strike a certain key, and he plays his exercises on the typewriter with as careful a regard to these points as the musician uses in his five-finger exercises. The wise amateur will not scoff at this accuracy, but will painstakingly train his rebellious fingers and careless mental habits until they are brought into conformity with rule. Only so will he attain that speed and accuracy of result which will put him in the first ranks of skilful operators.



HOW THE PITMAN SYSTEM WAS FORMED BY USING THE CIRCLE AND DIAMETERS

SHORTHAND WRITING, OR STENOGRAPHY

WHEN WAS ABBREVIATED WRITING FIRST PRACTICED?

SOME kind of effort to shorten the writing of words, or to represent them by signs, can be traced back to the Persians, Egyptians, and Hebrews more than one thousand years B. C. Abbreviated writing was practiced by the ancient Greeks. Specimens of Greek shorthand may be seen in the Vatican Library and in the British Museum. Shorthand reporting dates back definitely to the first century before the Christian era. Tiro, the freedman and secretary of Cicero, the Roman orator, was the first known person to report the speeches of his master, which were revised by the orator; and Plutarch says that shorthand reporters were scattered in various parts of the Senate House when the vote as to the fate of Catiline was taken, so as to take down the speeches of Cæsar and Cato. Roman shorthand was as good as the system practiced by Charles Dickens, who was a Parliamentary reporter and has given us his experience in the thirty-eighth chapter of "David Copperfield." History says the Emperor Titus was an accomplished stenographer, and that the Emperor Augustus taught the art to his grandchildren, as a wise grandfather might well do to-day. In Egypt in ancient times a slave boy was taught tachygraphy (Greek *tachus*, "short," and *graphy*, "writing") for 120 drachmæ, or $24.

Shorthand was used apparently by the early Christians, and St. Paul doubtless dictated some of his Epistles (see Colossians, where he tells us the salutation was written by his own hand, while the remainder is ascribed by an early manuscript to Tychicus and Onesimus). Modern shorthand had its first book printed in 1588 by Dr. Timothy Bright; the first French publication appeared in 1651, the first German in 1679. Gurney's is the oldest living system in English, and is still used in Parliament, although inferior and antiquated. Taylor's system appeared in 1786, was adapted to foreign languages, and suggested to Isaac Pitman the system which is now used in all English-speaking parts of the world, besides many others.

THE PHONETIC PRINCIPLE

The phonetic principle, or sound writing, was first applied to English shorthand by John Willis in 1602; but it was Isaac Pitman who formed it into a complete system, which made verbatim reporting possible. For this remarkable invention he was knighted by Queen Victoria. His younger brother, Benn Pitman, came to the United States in 1853 and introduced the system, also making some changes which render the writing and transcribing easier. He established an institute and publishing house in Cincinnati, and in 1903 the National Shorthand Association celebrated in appropriate manner his fiftieth anniversary of service.

Shorthand is now used in all lines of business, as well as in the courts and all public offices. Congress and the state legislatures have staffs of official reporters. Typewriting has become a part of the stenographer's equipment; while various modern inventions like the dictograph are used more and more in correspondence. This does away with immediate shorthand dictation, but requires the typewriter,

if not shorthand, in taking the dictation from the phonograph. A multitude of men and women are engaged as stenographers, and the demand for skillful and intelligent work constantly increases. This is one of the best-paid vocations. The United States Senate pays its corps $25,000 a year, and the House reporters receive annual salaries of $5000 each. In business offices the wages range from $8 a week for beginners to $20 and $25 a week. Court reporting is the most difficult and highly paid outside of Congressional work.

SOME THINGS TO REMEMBER

There are a few general rules for the mastery of shorthand. The first is that shorthand, or stenography, is *sound* writing; that is, the words are not written as they are spelled, but as they are pronounced. When a student learns this thoroughly, he has done much toward helping himself. When, for instance, the word *no* is heard, there is no way to tell which one of the two spellings, "know" or "no," is intended; but the sentence, "Do you know him?" and the answer, "No, I do not know him," are easily transcribed with the correct spelling, even if the same shorthand outline has been used to indicate both words. The mind must work as well as the hand.

Another help to the student is to realize that he must *write* his outlines, not *draw* them. The ear hears and the sound is carried almost magically from the ear to the hand and pen or pencil, and there should be no hesitation between the parts of the word; that is, at the angles or

Letter	Phonograph.	Examples of its power. *Initial*	*Final*	Name
P		*p*ost	ro*p*e	pe
B		*b*oast	ro*b*e	be
T		*t*eem	fa*t*e	te
D		*d*eem	fa*d*e	de
CH		*ch*est	et*ch*	chay
J		*j*est	ed*g*e	jay
K		*c*ane	lo*ck*	kay
G		*g*ain	lo*g*	gay
F		*f*ear	sa*f*e	ef
V		*v*eer	sa*v*e	ve
TH		*th*igh	wrea*th*	ith
TH		*th*y	wrea*the*	the
S		*s*eal	hi*ss*	ess
Z		*z*eal	hi*s*	ze
SH		*s*ure	la*sh*	ish
ZH		*j*our (Fr.)	rou*ge*	zhe
L		*l*u*ll*	fa*ll*	el
R		*r*oa*r*	fo*r*	ar
M		*m*et	see*m*	em
N		*n*et	see*n*	en
NG		......	si*ng*	ing
W		*w*et	......	way
Y		*y*et	......	yea
H		*h*and	......	hay

	Long.			Short.	
E		*ee*l	i		*i*ll
A		*a*le	e		*e*ll
AH		*a*rm	a		*a*m
AU		*a*ll	o		*o*n
O		*o*ld	u		*u*p
OO		*oo*ze	oo		f*oo*t

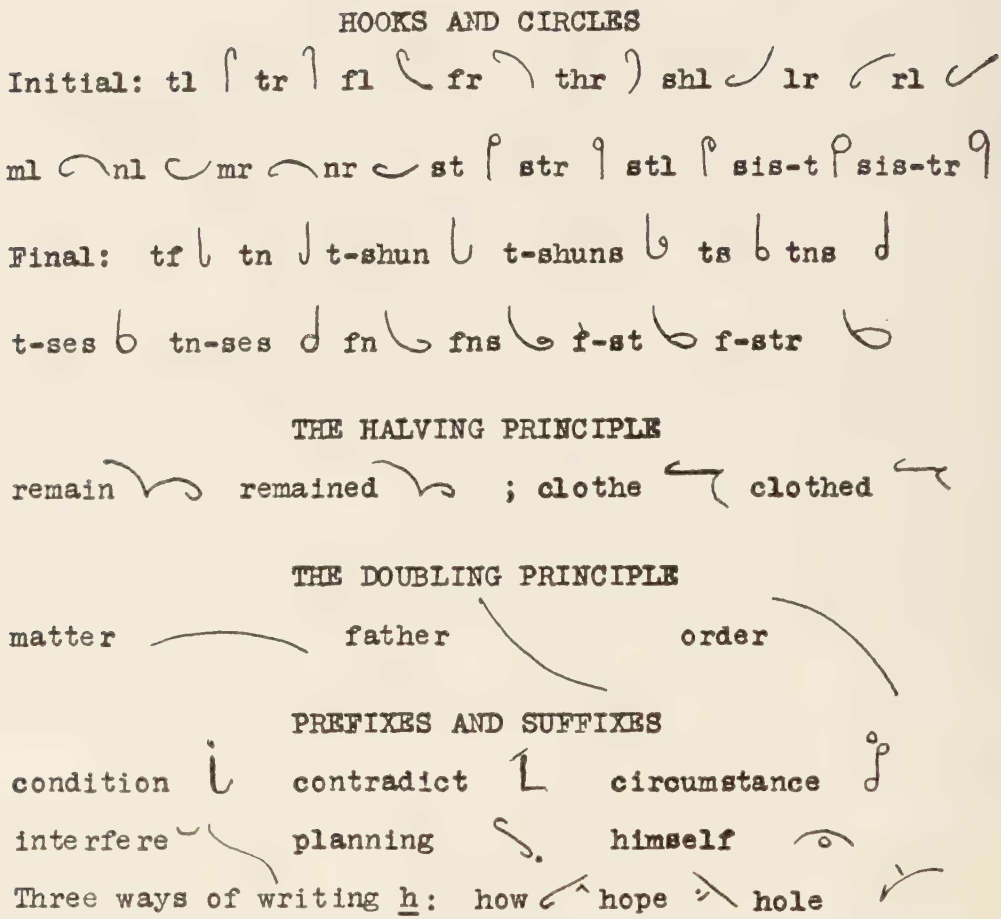
DIPHTHONGS.—I *i*ce AY *aye* OI *oi*l OW *ow*l

TRIPHTHONGS —WI *wi*ne WOI *quoi*t WOW *wou*nd

COALESCENTS.

WE		*we*	wi		*wi*t
WA		*way*	we		*we*t
WAH		q*ua*lm	wa		*wa*g
WAU		*wa*ll	wo		*wa*s
WO		*wo*ke	wu		*wo*n
WOO		*woo*ed	woo		*woo*d
YE		*ye*	yi		•
YA		*yea*	ye		*ye*t
YAH		*ya*hoo	ya		*ya*m
YAU		*yaw*n	yo		*yo*n
YO		*yo*ke	yu		*you*ng
YOO		*you*	yoo		•

THE SHORTHAND ALPHABET OF THE PITMAN SYSTEM



A FEW OF THE SIGNS

These examples were written for us by a stenographer, and reproduced in the same size as written. This is a more natural size than the alphabet, which is from a book.

other joinings of the component sounds. Speed should be acquired, too, as the student progresses, with sentences and phrase signs repeated so many times that their execution becomes almost a mechanical operation.

The three great rules for success are: Practice, *Practice*, PRACTICE; Write, *Write*, WRITE; and then read everything you write THREE TIMES.

EDUCATION AN ESSENTIAL

This is sure, that when a student has thoroughly mastered a stenographic system and acquired a fair speed — say a hundred words or more a minute — he has a fortune in his own right hand. To make a good stenographer, however, requires more than to be able to take dictation in shorthand. It requires knowledge of spelling and punctuation in order to write out the notes correctly. Besides that, the more one knows the better will he be able to work intelligently and avoid errors in transcribing his notes. Ludicrous mistakes are made by shorthand writers because they do not use their brains or else lack education. Get all the schooling you can, therefore, if you would

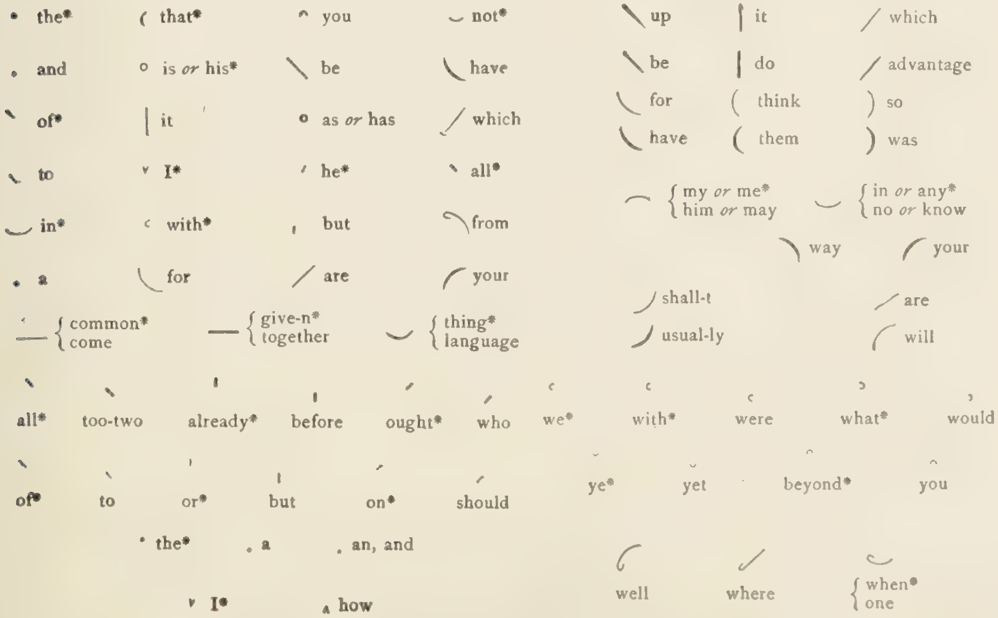
advance in any occupation. For shorthand, study words, absorb the dictionary, become familiar with the names of places, eminent public men, countries, great books, and authors. Everything will be useful.

It is valuable to every boy and girl to know something of shorthand. Much precious time can be saved if one learns only fifty "word signs" covering the words most frequently used, such as *a*, *the*, *and*, *for*, *if*, *when*, *which*, *who*, *of*, *to*, and so on. In taking notes in school work, and in numerous cases that will arise, this knowledge will be of practical help. Then the learning of shorthand is one of the best ways to develop and strengthen the memory, while it also trains the hand.

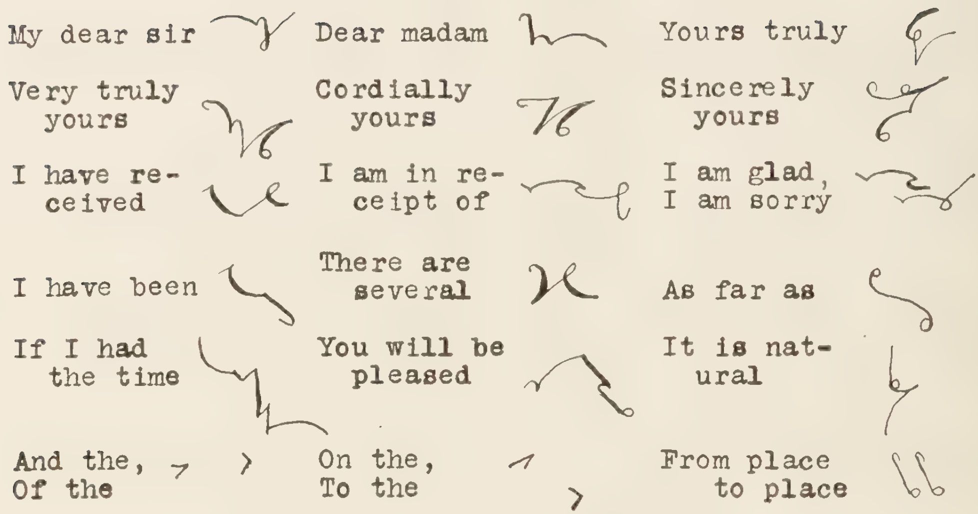
We give the principles of two systems, the Pitman and the Pernin, with sufficient fullness and illustrations to enable a boy or girl to gain a fair working knowledge, without other teacher. No teacher can impart the skill; that comes only from constant practice. But the student will be aided by the fact that this study becomes intensely interesting. This first system, the Pitman, is one of the most logical and scientific devices which the human mind has produced. The Pernin differs radically in making the vowel sounds a part of the written word, while in the Pitman the vowel signs are rarely used after one has become expert. Hence the Pitman may be called a consonant system, the Pernin a consonant and vowel combination. The Pitman is one of the oldest and one on which many of the later systems are based. The Pernin is more easily learned and read, because there is less memorizing and no attention has to be paid to position or light and heavy strokes; hence it is better adapted to persons of moderate ability. Each person must choose in such a matter, just as one must decide what make of typewriting machine he will adopt. Both of these shorthand systems will work — that is the main thing; and experts in either can write as fast as most people talk — which is fast enough.

THE PITMAN SYSTEM

The Pitman system is based on the circle and its diameter; or you may regard it as the rim of a double-tired wheel with eight spokes and an invisible hub. The tires are cut in sections.



WORD SIGNS OF THE PITMAN SYSTEM MOST FREQUENTLY USED



PITMAN PHRASES IN COMMON USE IN CORRESPONDENCE

as the diagrams will clearly show. The alphabet has twenty-six letters, the same as in longhand, but the shorthand alphabet, so called, is wholly composed of consonant sounds.

It seems a serious matter when you are told that there are over forty vowels in this shorthand system; but in reality it is very simple, for when you learn nine of them, the six long vowels and three diphthongs, you have practically learned them all. The six long vowels are *e*, *a*, *ah*, *aw*, *o*, *oo*. The first three are indicated by heavy dots at the top, center, and bottom of the stroke, or consonant sign, respectively, and the last three by heavy dashes in the same positions. The six short vowels are represented by light dots and dashes in the same positions (see diagram).

Then there are also two sets of coalescents: *w* and *y* (when used as vowel sounds) joined to the above long and short vowels.

The first three diphthongs are *i* (a combination in sound of *ah* and *e*), *oi*, and *ow*. These same sounds are used in combination with *w*, forming *wi*, *woi*, and *wow*.

The letter *h* is written in three different ways: the stroke, as shown in the alphabet, a dot used with the vowel, and a dash prefixed to a stroke.

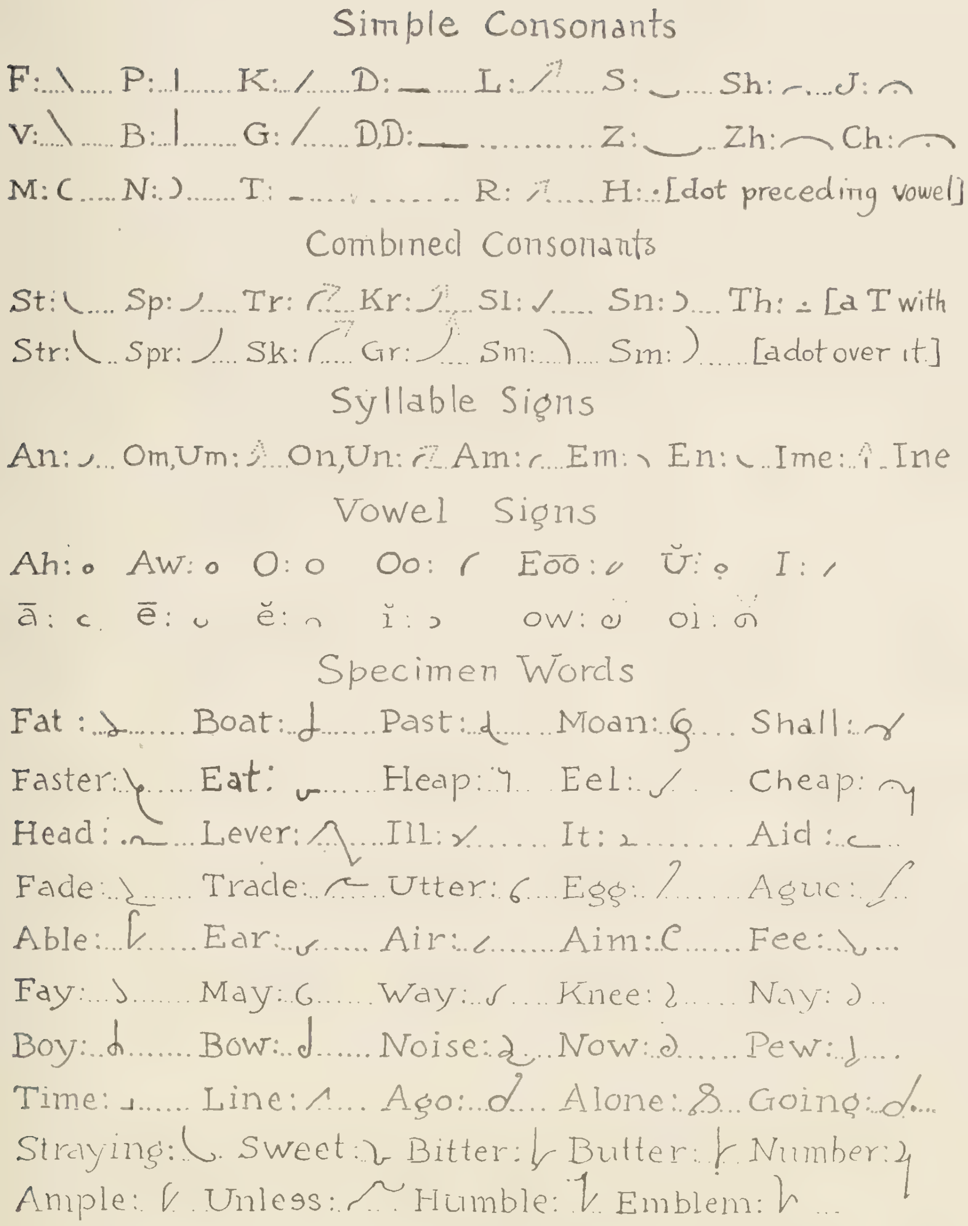
After all these vowels are thoroughly learned, they are discarded by rapid writers and the words themselves put in the position of the vowel; the first position being above the line, the second on the line, and the third through the line if a vertical stroke, and under the line if a horizontal one. Notebooks are usually ruled, although this is not necessary.

HOOKS AND CIRCLES

As many of our English words have two or more consonant sounds coming together, it is impracticable to represent them all by strokes. Therefore a series of initial and final hooks and circles are used to add to the ease and speed in forming the syllables in the words. Each initial hook or circle — *l*, *r*, *w*, *s*, *sis*, *sis-r*, etc. — may be used at the beginning of each stroke. The final hooks and circles — *f* or *v*, *n*, *shun* (the suffix *tion*), and the *st* loop — may be used at the end of each stroke.

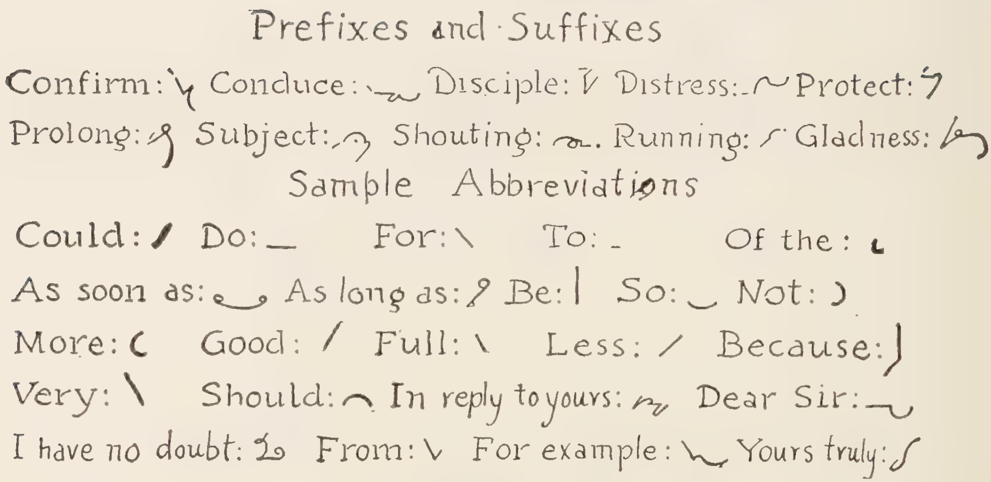
THE HALVING AND DOUBLING PRINCIPLES

Words that form the past tense by adding *ed*, or words ending in *t* or *d*, are made but half the length of the original stroke, and those curved letters that are followed by sounds of *ter*, *ther*, or *der* are made double the length of the original stroke.



THE ALPHABET OF THE PERNIN SYSTEM OF SHORTHAND, WITH SOME SPECIMEN WORDS, SHOWING HOW THE VOWELS FORM PART OF THE WORDS

This was prepared by a stenographer and represents the actual writing style. Those who wish to have everything written out will be attracted to this system; but no system is easy to acquire.



SIGNS IN THE PERNIN SYSTEM

PREFIXES AND SUFFIXES

Prefixes like *con* and *com*, *contra* and *counter*, *circum*, *inter* and *intro*, etc., and suffixes like *ing*, *self*, etc., are written near but not joined to the word.

WORD SIGNS AND PHRASES

In all written or spoken language a person always uses over and over again a certain number of ordinary words. It is therefore a great saving of time to have a set of abbreviations or "word signs" for these common words. The Pitman system has a list of word signs which should be memorized by the student.

Shorthand writers also join certain commonly used phrases, like "My dear Sir," "Yours truly," etc., in business correspondence. Phrases should be made up only of such words as have a natural relationship to one another, and should not be too long or extend too far above or below the line.

This is, in brief, the Pitman system of shorthand writing, and to the student just taking up the subject there seems to be a great deal for him to master. There are many words that need not be written out in full, but which can be abbreviated just as we do in longhand, and when this is done we call what stands for the word a "word sign." There are hundreds of these in the Pitman system. The argument is often put forth that the memorization of so many word signs is an almost impossible task. It is not, really, if the words are taken up logically and when the principle under which they come is being learned. Like everything else that has a science back of it, certain facts and truths must be learned and then put into practice daily, so that in a sense the writing of shorthand becomes a mechanical process. But at first it is a laborious process, and unless one has patience and "stick-to-it-iveness," success is impossible.

HARVEST TIME

WHERE DO WE GET OUR FOOD?

THE United States is one of the few countries able to produce sufficient food to supply the needs of its people. Yet even the United States imports great quantities of food products, for Americans like variety and crave the delicacies which must be obtained abroad. Look over the viands at a well-ordered dinner and you will find that nearly every corner of the earth has been drawn upon to provide what appears on your plate in the course of the meal.

WHERE DOES BREAD COME FROM?

Doubtless the article of food which comes first to the mind of everybody is bread. It is not without reason that bread has been called the "staff of life," for its use is almost universal and few meals are considered complete without it. In this country bread is closely associated with wheat, from which it is most often made. Until a few generations ago, however, barley was the grain most often used in bread making. To-day barley, rye, and millet take the place of wheat in many countries. Probably more people live on millet than on any other grain.

It is in wheat that we are most interested, for the United States is the greatest wheat-producing nation in the world. So important are the industries and the machinery connected with wheat growing and harvesting, and with the transformation of wheat into flour, that they have been the subject of special chapters in Volume II. In the northern central states, on the Pacific coast, and in western Canada there are ranches with thousands of acres on which nothing else is grown. When the wheat is ripe, one may ride for days and see only a billowy yellow sea. The wheat crop is watched with the keenest interest the country over. Business conditions are gauged by its extent. The crop of a recent year was so large that a train seven thousand miles long would have been required to move it all at one time. Such a train would extend twice across the continent. The amount of flour made is proportionate to the wheat crop — often one hundred million barrels in a year. Any story of our food supply must therefore begin with wheat, and with it comes the story of corn.

WHY IS CORN CALLED "KING"?

One often hears or reads that corn is king. Why is it so called? The answer is found in the statistics prepared by the government, which show that corn is the greatest crop we grow, amounting to two billion bushels, enough to fill a train which would encircle the earth

several times. The value of the corn raised by American farmers is greater than that of all the gold and silver mined within our borders. The business of the country depends even more upon the corn crop than upon the wheat crop.

Corn is an American cereal, and the early comers learned its value from the Indians. At first it was called "Indian corn" or "maize." Soon it was growing in other lands, but even now the United States produces four fifths of the world's supply.

Popcorn is a peculiar variety of maize which explodes when subjected to intense heat and turns almost entirely inside out. The great bulk of the popcorn crop comes from Iowa, Michigan, Illinois, Wisconsin, and Nebraska. More than three hundred carloads have been shipped from a single locality in one season.

The yield of corn on a given area has been greatly increased by careful selection of the best seed. This is well, for the demand for corn and its products is tremendous and constantly growing. It is true that corn meal is not in such common use in the kitchen as wheat flour, but it is by means of corn that the farmers are able to keep our tables supplied with beef and pork and poultry. Comparatively little corn is exported; much of it is fed on the farms on which it is produced. We really eat more of it than we realize. Hominy, cornstarch, and glucose, as well as various breakfast foods, are made of corn. Sweet corn is a garden crop, about which the early settlers learned from the Susquehanna Indians. Great quantities of sweet corn are canned each season, with New York producing more than twenty-one per cent of the total. Much canned corn also comes from Maine and some of the Central states. Perhaps it is now easier to understand why corn is called "king."

WHERE DOES OUR MEAT COME FROM?

For several years the price of meat has been rising. This is especially true of beef, and the reasons given seem logical. The population of the country is increasing out of proportion to the increase in beef production. At present most of the beef eaten here is grown on the plains of the West and on farms scattered all over the country. Some shipments from the Argentine Republic have been received, and it is probable that Mexico will grow considerable beef for this country in years to come.

The West is being more and more divided into ranches and fenced; the day of the cowboy, who figures picturesquely in much of our fiction, is passing. Millions of cattle are raised on the plains, but many more are brought to maturity in the great corn-producing sections. Beef animals from the ranches are often sent into the corn belt to be fattened. When ready they are loaded on trains, special cars being provided for them, and are transported to Chicago, Omaha, or Kansas City, where the great packing establishments are located, or to smaller cities.

The meat-packing industry has assumed enormous proportions, as may be realized when we read that in a single year the output amounts to about $800,000,000. The stockyards cover scores of acres, and through them passes a steady procession of cattle and hogs. When the animals have been killed and dressed, the carcasses are loaded into refrigerator cars and shipped to all parts of the United States and Canada. Many of them are placed on ships when they reach the seaboard and carried to Europe and other parts of the world.

Americans are very fond of pork, and the hogs on the farms of the United States and Canada are worth $435,000,000. The Western corn belt is the great hog-growing section, and it is a common practice to allow these animals to follow the cattle and eat the wasted grain. It is only on small farms that the pigs are kept confined to filthy little pens. Even in the Eastern states there are establishments where several thousand pigs are raised each season. As a rule, they are pastured in the summer, but most Eastern hog growers depend largely upon the garbage from the large cities, for which there is often spirited bidding. Altogether, we raise far more pork than any other nation, and much of it is shared with the people of other lands. The pork we grow on our farms is worth as much as the gold we dig out of the earth. Much of this pork finds its way to Chicago, the greatest pork-packing city in the world. Some of the meat is fresh when shipped, but most of it is cured. What with hams and bacon, pickled feet, sausages, and lard, nothing is wasted. Bones, blood, and hide have their

IN THE CHICAGO STOCKYARDS

Top: Forcing cattle through a trench containing water with [illegible] President Taft is looking on. Bottom: Inspecting and [illegible]

uses. Even the teeth and the tails are sold. The packers say that nothing is lost but the squeal.

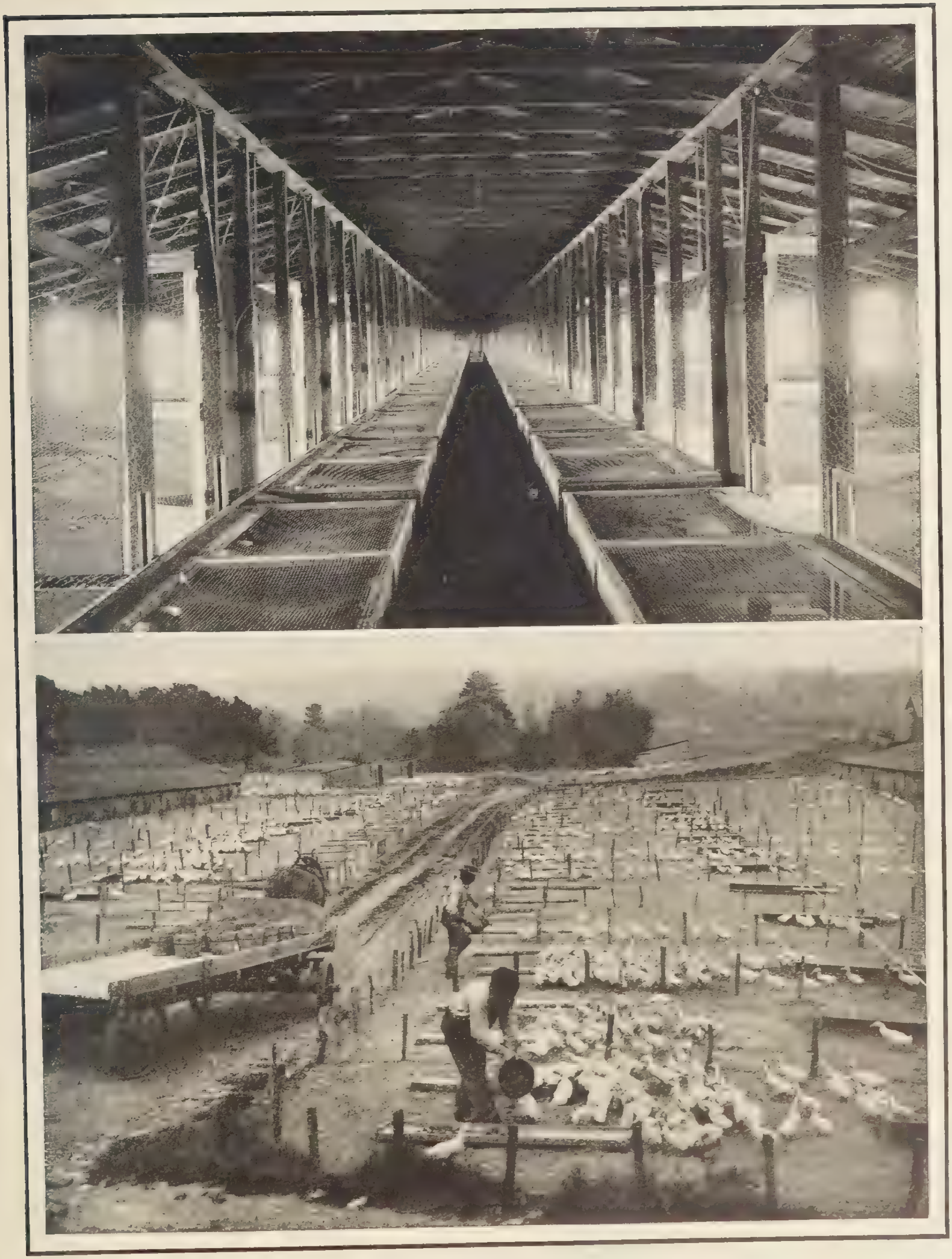
Colorado, Montana, and Wyoming are the sheep states, and large flocks move over wide ranges. There is little sheep growing in the East, largely because of the dog nuisance, although many farmers of eastern Canada have extensive flocks. We grow just about enough mutton for our own tables, but the industry seems to be advancing.

DRIVING A FLOCK OF GEESE TO A FATTENING FARM

WHO SUPPLIES OUR POULTRY?

In former times poultry raising was merely an incident in farm life. Now it has become a business of vast proportions and with many interesting ramifications. In one California city, Petaluma, in Sonoma County, a million fowls are kept. There are many large poultry plants in various parts of the country, and yet by far the greatest number of eggs and dressed chickens come from the general farms. The total number of eggs laid in a year is close to sixteen billions, and many of them are transported long distances to market. Comparatively few eggs are shipped abroad, and there is a growing tendency to import eggs from Russia and other European countries and even from China. Our farmers would make more money from their hens if they were more careful in their handling of the eggs they sell. It has been estimated that there is an annual loss of $45,000,000 due to carelessness in packing and marketing eggs.

The Middle West is the greatest poultry section of the country, and large numbers of eggs are shipped as far East as Boston. An extensive business in dressed poultry has also grown up in the Central states, where the



POULTRY RAISING

Top: A brooder house on a large commercial poultry plant in the Middle West. Bottom: Feeding the ducklings on a New England duck ranch.

packing houses have built special fattening establishments. One plant in Illinois will accommodate ten thousand chickens. The birds are collected in wagons sent into the farming districts and are fattened in small coops. Then they are dressed, chilled in immense refrigerators, and shipped East. The chickens reach the market in much better condition than when shipped by the average farmer, and there is a difference of from three to seven cents a pound in specially fattened chickens and those just off the range. Sometimes milk is given and the birds are sold as milk-fed chickens. Sometimes, too, cramming machines are used, a soft tube being forced down the throat of the fowl and food of a fattening nature administered through it by pressing a pedal with the foot.

Duck raising is a highly specialized industry, and there are a number of duck farms in New England and Pennsylvania and on Long Island, where from twenty to fifty thousand ducklings are raised each season. White Pekings are used exclusively and are expected to weigh six pounds when ten or eleven weeks old. They are called "green ducks" when marketed at that age and command high prices.

Unlike ducks, geese and turkeys are raised entirely on general farms. There are men in several parts of the country who gather up from ten to twenty thousand geese in the late summer and fatten them for the Christmas trade. Each season several carloads of these birds are shipped to the States from Prince Edward Island, Canada. The cars are fitted with platforms, one above another, and nearly fifteen hundred birds are crowded into a car. Raw potatoes are spread on these platforms and give the geese both nourishment and water while they are on the journey. After the birds are unloaded from the cars, they are driven over the road three miles to the fattening farm.

WHERE ARE THE VEGETABLES GROWN?

If vegetable growers had not kept pace with the times, a potato would now be worth as much as a box of candy. When the feeding of our great cities had come to present a serious problem, the experiment of growing vegetables under glass was made, with the result that there are now twenty-four thousand glass-inclosed acres in this country. Probably more than $100,000,000 has been invested in farms under glass, and there are single greenhouses six hundred feet long. Of course potatoes are not grown in this manner, but immense crops of lettuce, cucumbers, and tomatoes are produced at seasons when the ground outside is buried under a heavy blanket of snow. In almost all the cucumber houses bees are used to fertilize the blossoms, there being a hive to every one hundred and fifty feet. Even strawberries, muskmelons, and grapes are grown in hothouses, but most of the grapes sold in Eastern markets out of season are imported from England. As the muskmelons are heavy, they are usually suspended in slings and present an odd appearance.

Huge steam or hot-water boilers are required in order to maintain a summer temperature in the greenhouses in the dead of winter. Ventilation must receive careful attention, and many large growers even sterilize the soil which they use. Watering has been simplified by new systems which cover the ground with a fine mist, that saturates the earth but does not wash out the finest seeds.

Most of the large cities are surrounded with market gardens, but many sections are famous for special crops. Eastern Massachusetts growers ship cucumbers to parts of the country far away. Michigan is noted for its celery, and Kalamazoo is known as the "celery city." Colorado is known far and wide for its Rockyford cantaloupes, which are shipped all the way to the Atlantic coast. In Massachusetts, New York, and Iowa large tracts are given over to onions. Texas, too, is an onion state and gives us a large proportion of the Bermudas we eat. New York and Michigan are the leading bean states. The most important potato-growing states are New York, Wisconsin, Michigan, Pennsylvania, Maine, and Iowa.

It may be said that the potato is, next to rice, the most valuable crop in the world. One acre of potatoes, it has been estimated, will furnish as much food for human beings as ten acres of wheat. Europe grows a vast potato crop every year and is able to produce more bushels to an acre than we are. There is a fluctuating importation of potatoes.

Although they have spread all over the globe, potatoes belong to the New World. The Spaniards found the Indians of South America eating them, and carried samples back to Spain. At first the potato was fed to hogs, but the people of Ireland began to eat it in a period of famine, and their early use of this vegetable on their tables explains the name "Irish potato." The sweet potato is grown in the South and as far north as Pennsylvania, and to some extent in New Jersey and Illinois. The crop is an important one and sells for more than $20,000,000.

WATERMELON TIME

IS OUR FRUIT HOME GROWN?

Apples, pears, cherries, plums, and peaches grow to perfection in various parts of this country. Oregon is famous for its handsome eating apples, which are sent in boxes all the way to the Atlantic coast. The Albemarle pippins of Virginia are considered by the English to be the best apples grown. New York, Pennsylvania, and Missouri have many orchards, and the beautiful Annapolis valley in Nova Scotia is a famous apple-growing section, the fruit being shipped both to England and the United States. California buys apples from other states, but in turn sells them cherries, oranges, grapes, and lemons. Florida also grows oranges, but in order to have enough to go around we are obliged to buy large numbers from the West Indies and the countries of southern Europe. We also import many lemons. California has a hundred million grapevines, but much of the fruit is dried for raisins. Twenty-five pounds of grapes will make five pounds of raisins. Raisin making is a comparatively new industry for this country. Formerly we secured all our raisins from the

countries along the Mediterranean Sea. Many grapes are grown in western New York, and there are vineyards all over the country.

Georgia in the East and California in the West are famous for their peaches. Even Connecticut grows many, and in the whole country there are at least a hundred million trees. Formerly we bought all our prunes in France, but now we grow more prune plums than the Frenchmen. All the Pacific coast states produce them. The plums are dipped in lye, which cracks the skins. Then they are allowed to cure in the sun, after which they are packed in boxes. Many olives are grown in California, but not enough to meet the demand, and we still import both olives and olive oil from Italy and Spain.

Persia and Egypt supply us with dates and Smyrna with figs. The dates are left on the trees until they shrink, and the juice is drained away before they are packed. Figs are dried in the sun and then pressed into the shape they have when we buy them. We raise a few pineapples in the United States, but most of those found on our tables come from the West Indies, the Bahamas, and the Hawaiian Islands. Like many tropical fruits, the pineapples are picked green when they are to be shipped.

PACKING HOUSE FOR ORANGES AND OTHER CITRUS FRUITS, CALIFORNIA

Bananas come to us from Cuba and Central America, and the cultivation of this fruit has become an industry of vast proportions. Great boats are constantly arriving at our seaports with cargoes of green bananas, which are carried by rail to all parts of the country. The banana plant dies after it has matured one bunch, but suckers are constantly coming up from the

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PICKING GRAPES AND PACKING THEM FOR SHIPMENT

Courtesy of Northern Pacific Ry.

A BRANCH OF A JONATHAN APPLE TREE

roots, to bear in their turn. When we see bananas in the stores, the bunches usually hang with the fruit down, but when growing they point upwards.

ARE PEANUTS REALLY NUTS?

Although classed as nuts, peanuts are really vegetables. They grow underground, but have a pretty little plant with a yellow blossom. As each blossom passes a little stem is produced, which buries itself in the earth, and on the end of this stem the peanut pod is formed. When the pods have been cleaned and sorted, they are shipped far and near. Peanut growing is a very important industry in Virginia.

We also eat many real nuts, importing large numbers of almonds from Spain and neighboring countries, pistachio nuts from Syria, and cocoanuts from various tropical countries. Many almonds are now grown in California.

WHERE IS OUR SUGAR GROWN?

Our sugar, of which every person in the United States eats an average of a pound and a half a week, comes from sugar cane and from beets. We get our cane sugar from Cuba, Porto Rico, Hawaii, and the Philippines, in addition to the large amount raised in the Southern states. Beets for sugar are grown largely in Michigan, Nebraska, Utah, and California. (For a further account of this and other food industries, see Volume II.)

WHERE DOES OUR HONEY COME FROM?

Not many generations ago sugar was unknown and honey was depended on for sweetening. Honey production is an ancient industry, for we find honey mentioned several times in the Bible. The United States is now the leading honey-producing nation of the world. The value of a season's output of honey and wax often runs as high as $25,000,000, yet thousands of pounds are imported from Cuba, Mexico, and various South American countries. The world's honey crop exceeds six hundred million pounds. At one time it was expected that maple sugar would be of great commercial importance, but it is now only a luxury. Most of that on the market comes from Vermont, New York, and Pennsylvania.

WHERE DO WE GET OUR FISH?

With the price of meat rising, it is natural that we should eat more fish. It hardly seems probable that there will ever be a fish famine. We get salmon from Alaska and the state of Washington, cod from the fishing banks of Newfoundland, mackerel all the way from the Gulf of St. Lawrence to the Southern states, and many other less common fish from lakes, streams, and the deep sea. Sardines and some other fish delicacies are imported. The little herrings canned in Maine are about as good as the genuine sardines.

The oyster and the lobster are found up and down the Atlantic coast; but Chesapeake Bay is the most noted oyster section, and millions of oysters are shipped from Baltimore to other cities. Baltimore is also famous for its crabs.

More than half of all the boats engaged in fishing in the entire United States are owned in New England. Even on the coast of Alaska there is a fleet of fishing boats manned by crews from Boston and Gloucester. Forty thousand men are engaged in fishing on the New England coast, and Boston handles one hundred and fifty million pounds of fresh fish each year, including lobsters and clams, with a total value of $6,000,000.

WHO MAKES OUR BUTTER?

Three billion gallons of milk are required to make the butter eaten in the United States. This makes one billion four hundred and ninety-two million pounds. Formerly all our butter was made on the farms, but of late years hundreds of creameries have been established and butter is turned out by machinery in enormous quantities. There are other factories which melt the poorer grades of butter from the farms into a uniform mass and add a certain amount of fresh cream, thereby securing a much better product. Unfortunately much of the farm-made butter is very poor in quality, because of carelessness and inadequate facilities.

Butter is somewhat high in price, and a vast trade in a substitute known as "oleomargarine"

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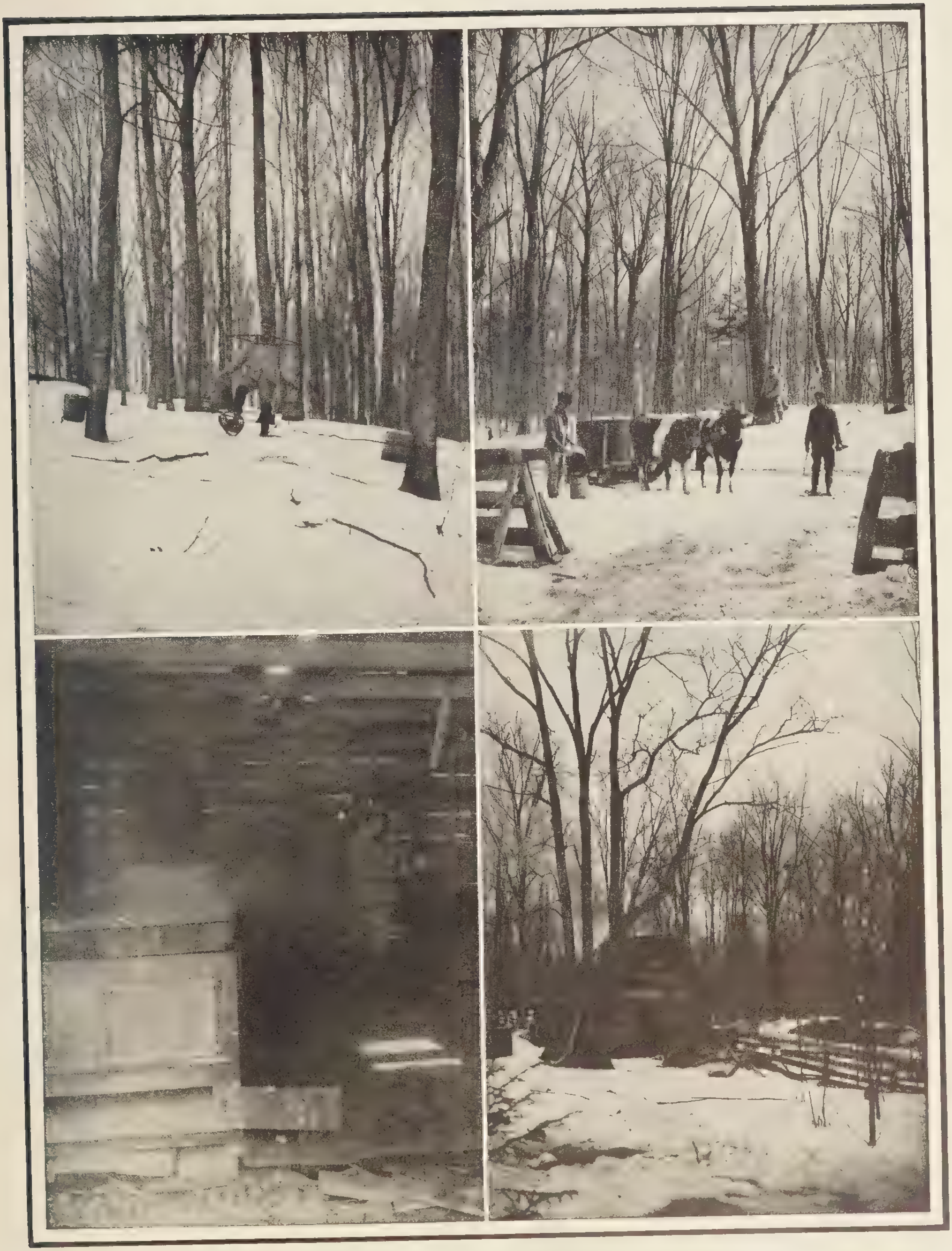
TAPPING A MAPLE TREE AND GATHERING SAP FOR SUGAR OR SIRUP

The pioneers of New England and Canada made maple sugar, learning how to tap the trees from the Indians, who had a time on their spring calendar named for the "sugar-making moon."



MAKING MAPLE SUGAR

Top: Carrying the sap from tree to sled. Bottom: Boiling the sap down to sugar in the sugar hut.

or "butterine" has been built up. This artificial butter is made from the fat removed from beef animals at the time of slaughtering, combined with neutral lard and milk. Cottonseed oil is often added to the cheaper grades.

MAKING BUTTER

Oleomargarine is clean, wholesome, and as nutritious as butter, although it lacks the fine flavor which appeals to discriminating tastes. It keeps better than butter, and when sold for what it actually is, there can be no objection to its use. About one hundred and thirty million pounds of oleomargarine are made in this country each year, but we do not eat it all, for large quantities are sent to England, Germany, and other lands.

WHEN WAS CHEESE FIRST MADE?

Cheese was a common food long before butter was known. The old Romans had a kind that resembled Limburger, and the early Egyptians made cheese of sheep's milk. Common or Cheddar cheese, made from whole or skimmed milk, is the kind most commonly eaten in this country and is entirely a homemade product. The milk is curdled by small pieces of rennet, which come from the stomachs of calves. Then the whey or water is pressed out, leaving a solid mass for curing and ripening.

Foreign cheeses are popular in the larger cities, and about a million pounds are imported annually, mostly from Switzerland and Italy. A large proportion is made up of Swiss or Schweitzer cheese, which is easily recognized because it is full of holes. Roquefort cheese is the kind which is permeated by a green mold. This mold is cultivated in bread, which eventually turns entirely green. A very little of the bread carrying the bacteria is placed in each lot of cheese, and the mold soon spreads. Stilton cheese comes from England and is ripened two years. Parmesan cheese, from Italy, is best when ripened three or four years and is so hard that it will keep indefinitely. Camembert cheese comes mostly from France, although some is made in this country.

If you are interested to learn why Limburger cheese has the pungent odor for which it is noted, you will find the explanation in the fact that the cheese is kept in an extremely moist condition while ripening, which sets up a putrefactive fermentation. Pineapple cheese is simply ordinary cheese pressed into the shape which gives it its name. Neufchâtel, which comes wrapped in tin foil, is an unripened American cheese, made with sweet milk to which rennet has been added.

In the making of butter and cheese much salt is used, and it will be interesting to learn where it comes from. The bulk of our salt is obtained from beds or mines, which are to be found in New York, Ohio, Pennsylvania, Virginia, Louisiana, and a few other states. In some places it can be pumped out in the form of brine, while in others it must be blasted like rock. We get all our salt at home, for we produce more than any other country. In many parts of the world sea salt is obtained by evaporation, and this process is carried on to some extent in California. (For the story of salt see Volume II, page 394.)

Courtesy of Northern Pacific Ry.

FORTY VARIETIES OF GRAPES ON EXHIBITION

WHAT KINDS OF FOOD MUST WE EAT TO LIVE?

OUR appetites have always called for certain combinations of food, and housekeepers have planned, by instinct and common sense, well-rounded meals, with meat, potatoes, vegetables, bread, butter, fruit, and sweets. Now they are being told by scientists why the body craves this variety and what each kind of food contributes of nourishment. It is an interesting study to follow a little way, and is valuable because it suggests what proportions it is wise to keep in a diet, and what substitutes and variety may be offered without changing the food values.

Food is classified, according to modern domestic science, as made up of protein, carbohydrates, fats and oils, mineral matter, and water, which sounds very remote and learned till we find out how our ordinary articles of food fit into these various classes. The housekeeper will do well to study her menu from this point of view.

WHY DO WE EAT SEVERAL KINDS OF FOOD?

We enjoy a varied diet best, and whatever adds to our pleasure in eating adds usually to the value of the food in our bodies. We also need the different food principles for different purposes. What is called a "balanced ration" is the right proportion between the amount of protein (eggs, milk, meat, fish) and of fats and carbohydrates (sugars and starches).

A person needs daily about four ounces each of protein and of fat, and fifteen ounces of carbohydrates. With this weight of dry food we should have daily about six pounds or three quarts of water, either in solution in fruit, or in liquid form. It is easy to see why we enjoy eating combinations of foods when these combinations not only are pleasant to the taste, but also furnish us with the nourishment we need.

A CREAM SEPARATOR

WHY IS MILK NOURISHING?

Milk contains all the food principles in an easily digested form, so that it forms a perfect food for babies and is very useful for invalids. For grown persons who are well the proportions are not perfect. Such persons require also the bulk which is furnished by solid food. Eggs are, in a somewhat less degree, a typical food.

WHY DO WE COOK FOOD?

Sometimes, as in the case of tough meat, in order to soften the fiber so that we can chew and digest it more easily. Sometimes, as with starchy vegetables like potatoes, beans, and peas, to make the starch more digestible. Again, we cook food in order to get new and appetizing flavors by putting different kinds together. (Read the story of "How the Polynesians learned the secret of cooked food," Volume I, page 270.)

WHAT IS THE DIFFERENCE BETWEEN FATS AND OILS?

A substance which at ordinary temperatures is solid we call a "fat." One which at ordinary temperatures is liquid we call an "oil." They are similar in chemical composition and in their use in the body.

WHAT IS THE FOOD VALUE OF CHEESE?

Cheese is chiefly a protein-furnishing food. It may therefore take the place of meat to a certain extent. Cooked cheese, if prepared at the proper temperature so that it does not become tough and hard, is now considered as digestible as raw cheese, if not more so. It is well to introduce a "milk ferment" in the form of either cheese or buttermilk into the diet.

WHAT IS THE FOOD VALUE OF FRUITS?

Fruits contain a large percentage of water in the composition of their juice. The solid

A FIRELESS COOKER

See also Volume VII, page 390.

FRUITS AND VEGETABLES

Melons, lettuce, radishes, cucumbers, and onions.

matter is made up largely of a very delicate wood fiber called "cellulose." There is also mineral matter in the form of fruit acids, as well as sugar in sweet fruits. Fruits furnish us, then, with water and mineral matter and are not particularly nourishing. They are often very good for digestion, and by their attractiveness stimulate the appetite.

WHY DO WE EAT VEGETABLES?

The food value of vegetables is much the same as that of fruits. They contain much water, mineral matter in the form of vegetable salts, sugar occasionally, cellulose, and sometimes starch and protein. They stimulate the appetite, promote digestion, and yield mineral matter in a form easily assimilated. Spinach, for instance, furnishes iron in a more natural and therefore better way than in medicine.

WHY DO WE EAT CEREALS?

To supply the carbohydrate material needed to balance the protein and fat of our daily diet. Cereals furnish also mineral matter which aids materially in building up strong teeth and bones.

WHAT IS THE FOOD VALUE OF PEPPER AND OTHER SPICES?

Spices are useful in aiding digestion by stimulating the appetite and starting the flow of the digestive juices. They are not real foods.

WHAT IS THE FOOD VALUE OF GELATINE?

Gelatine is not really a food, but is what is known as a "protein saver." Less protein is required when gelatine is used in the diet. This is a matter of economy and also a help when too much protein is a menace to the health.

WHY DO WE BAKE BREAD?

To cook the starch and stiffen the texture; to kill the yeast; to drive off the alcohol produced by fermentation; to expand the gases in the dough and make it rise; to brown the crust and develop the flavor.

WHY DOES BAKING POWDER ALWAYS CONTAIN STARCH?

To prevent the two ingredients of the powder from acting on each other and setting free the gas which raises biscuit, cake, or pastry. Any moisture would start this action. Starch is therefore added to baking powder to take up moisture in the air.

WHEN MILK SOURS, WHAT HAS HAPPENED?

Certain germs called the "lactic acid bacteria," always present in milk, have been growing and spreading. Heat hastens their growth. Warm weather or exposure to heat therefore gives a chance for them to grow and multiply fast in milk and turn it sour. Heating fresh milk to the boiling point will keep it from souring because the germs will be killed.

WHY DOES HOT WATER CRACK GLASS AND CHINA?

BECAUSE it creates a tension of the material by the unequal degree of expansion between its interior and its exterior. If a glass is heated gradually, the difference in temperature has time to penetrate through the substance, equalizing the tension. Glass, being a poor conductor of heat, is peculiarly susceptible to such sudden changes.

WHY DOES BURNING WOOD CRACKLE?

Wood is a fibrous substance, and between the fibers there are little air spaces called "cells" filled with air or other gases or with moisture. When the outside of a stick of wood becomes heated by the flame of the fire, the air or moisture in the cells near the surface becomes suddenly heated and expands with explosive force, tearing down the thin partition of fiber on the outside and thus permitting the escape of the gas.

A variety of noises is heard: little pops due to the explosion of the gas, and cracklings due to the sudden tearing asunder of the wood fibers.

WHY ARE KILKENNY CATS ASSOCIATED WITH FIGHTING?

The reason is found in this old ditty:

There once were two cats in Kilkenny
Who each thought there was one cat too many,
So they howled and they "fit," and they scratched and they bit,
Until instead of two cats there was n't any.

WHY DOES PUTTING OIL ON STAGNANT POOLS KILL MOSQUITOES?

The mosquito lays from twenty to forty dozen eggs and sticks them together, side by side, to form a little raft. When the young are hatched, they live under water for a time. They must, however, come to the surface to breathe. If there is a covering of oil over the water, they cannot get the open tips of their breathing tubes through to the air. So they drown.

WHY IS AN EARTHQUAKE IN SAN FRANCISCO RECORDED IN LONDON BEFORE THE NEWS COULD REACH THERE BY TELEGRAPH?

The vibration travels through the earth faster than it could be sent above the surface of the ground by telegraph, telephone, or cable. In London it will be recorded almost instantly by the pen of a seismograph. (See Volume II, page 225.)

WHAT CAUSES EARTHQUAKES?

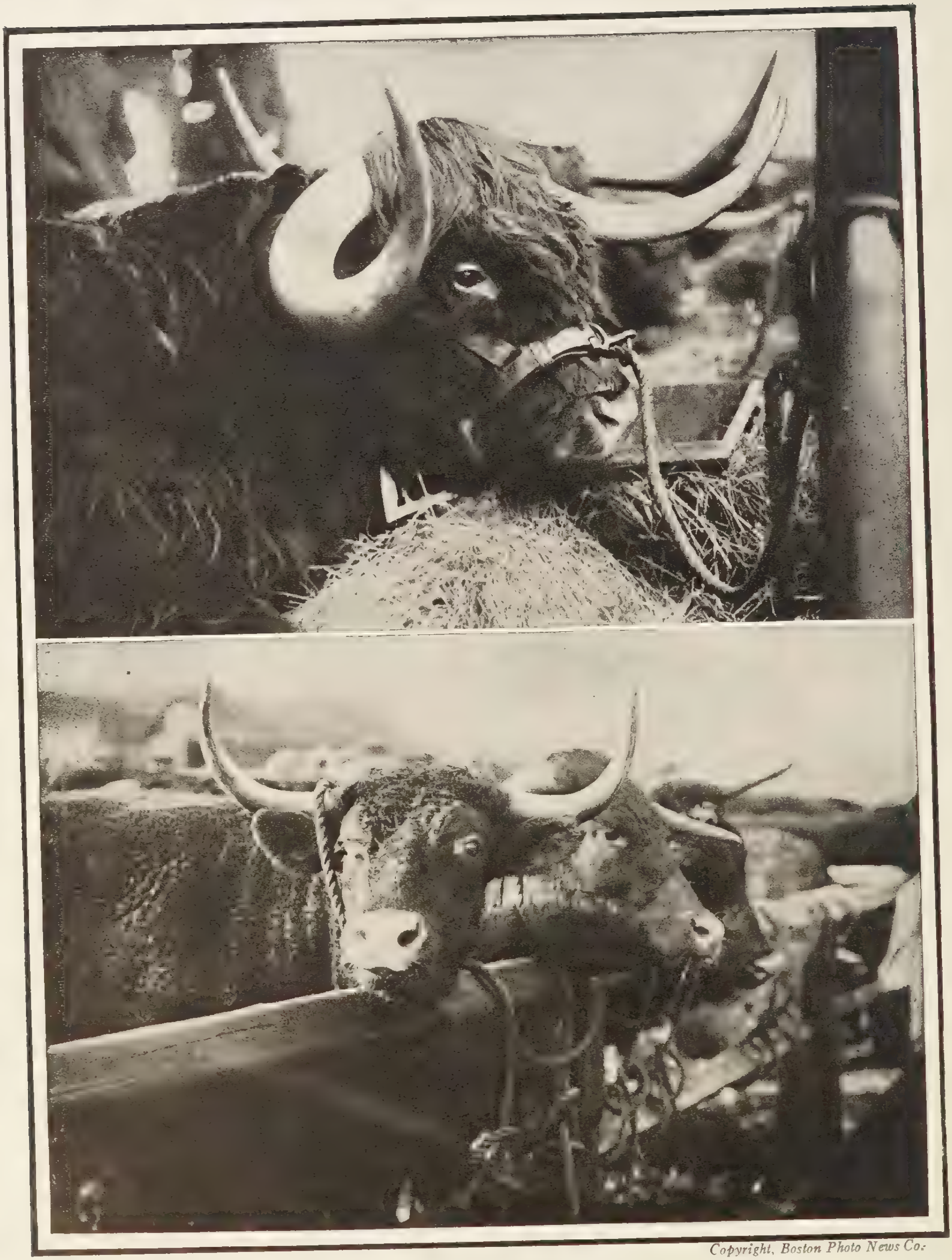
See Volume I, page 125.

WHY IS A LOCOMOTIVE NOISIER WHEN IT STARTS THAN WHEN IT IS TRAVELING AT HIGH SPEED?

When a locomotive is starting, the great inertia of the train has to be overcome. To do this the engineer so controls his valve motion that steam is admitted practically during full stroke. This steam passes out to the exhaust in the smokestack at about the same pressure as that in the boiler, causing a noisy puff. When the engine has attained headway, the engineer "links up"; that is, he adjusts his valve gear so that the steam is cut off at part stroke, allowing it to expand in the cylinder to a low pressure before being exhausted, consequently giving a softer puff.

HOW DOES A STEAM ENGINE WORK?

See Volume II, page 25.



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HIGHLAND CATTLE

A small but sturdy variety which stands the inclement weather of northern Britain better than any other breed. They have been imported into the United States recently for crossbreeding, and some are to be found in North Carolina.

DAIRY CATTLE IN AMERICA

WHAT ARE THE LEADING BREEDS?

THERE are about fifteen million dairy cows in the United States, but only half a million belong to recognized breeds. Eight millions are classed as "grades," which means that they contain a certain percentage of pure blood, and all the rest are nondescripts commonly termed "scrubs," but more politely referred to as "native" cattle. Some native cows give as much milk as thoroughbreds, but on the whole the latter are much more profitable. There is now a general tendency to improve the stock of the farms. This is highly desirable, as the average cow gives less than twenty-eight hundred pounds of milk a year, while experts say that no cow which gives under six thousand pounds is worth keeping.

At least a hundred breeds of cattle exist in the world, but comparatively few are found in this country. Of the dairy breeds only ten are common enough to be worth speaking of. They are the Jersey, Holstein-Friesian, Ayrshire, Guernsey, Dutch belted, brown Swiss, Devon, shorthorn, red polled, and French Canadian.

Probably all breeds have descended from one parent stock. Their different characteristics, now very marked, have been determined partly by environment and natural conditions, but to a greater extent by artificial conditions produced by man. Whether a breed improves or deteriorates depends upon the breeders into whose hands it has fallen.

WHAT IS THE JERSEY TYPE?

Doubtless the best-known dairy breeds in this country are the Jerseys and the Holstein-Friesians. The former came from the island of Jersey in the English Channel, about thirteen miles from France. For a century or more the importation of outside cattle has been prohibited, with the result that the Jersey type has become very firmly fixed. The climate is so mild that the cows may be kept in the open air most of the year. As land is expensive, they are kept tethered, being given a new spot each day to graze over. They are cared for by the women and often milked in the fields.

Jerseys are small and nervous. The weight of cows ranges from seven hundred to a thousand pounds. They vary in color, but solid shades of fawn or brown are preferred in this country. The horns are small, incurving, and often black-tipped. Good Jerseys are always fine-boned, with bright, prominent eyes, set wide apart, and a generally alert appearance. Although naturally gentle the cows become unruly if not carefully handled, and the bulls are often vicious and hard to manage.

The Jersey cow gives less milk than some others, but it is exceptionally rich in butter fat. Jerseys are kept especially for butter making and to supply a cream market. Single individuals have produced as much as one thousand pounds of butter in a year. Probably this is the favorite family breed, for in addition to yielding milk of extra quality, the Jersey consumes a comparatively small amount of food.

WHAT IS THE LARGEST DAIRY BREED?

Holstein-Friesians represent an entirely different type. They are the largest of the dairy cattle, cows weighing as high as fifteen hundred pounds. As found in this country they are black and white in color, with small horns tapering finely toward the tips and inclining forward. Their native home is a section of the Netherlands bordering on the North Sea, and formerly they were called Dutch cattle. The history of the breed can be traced back two thousand years. These cattle are wonderfully vigorous and hardy. The Friesian people give them the greatest care, stabling them under the roof which shelters the family, often with only a partition between, and grooming them like fine race horses. In summer they are led to luxuriant pastures, where they need move only a few steps to eat their fill, and they are protected from insects by canvas blankets.

SIX OF OUR COMMON BREEDS

Top: Dutch belted; Jersey. Middle: Devon; Holstein-Friesian. Bottom: Ayrshire; Guernsey.

This is the greatest milk-producing breed. Many individuals have records of eighteen thousand pounds or more in a year. The milk is not rich, however, nor highly colored, but it approaches the human product more closely than that of most breeds and is unsurpassed for feeding children and for general use.

This is the breed largely kept by milk producers who supply city customers, and the milk is of much higher quality than its appearance might indicate.

WHAT ARE THE OTHER SPECIAL-PURPOSE BREEDS?

At home Guernsey cattle are neighbors of the Jerseys, for they, too, come from one of the Channel islands, as the name indicates. They are somewhat larger, however, and a little coarser in appearance. In color they are usually fawn or light yellow, with patches of white. They are quieter than the Jerseys and the bulls are easier to manage. They yield about the same amount of milk, which is extremely rich,

making them exceptional butter producers. The composition of the milk is also particularly adapted to cheese making.

Scotland is the native home of the Ayrshires, which weigh about one thousand pounds and have large bodies, with rumps set unusually high. Red and white in patches describes the color of most Ayrshires seen in this country. They are mild-mannered cows, yet hardy and active and well able to forage for themselves on pasture land where grazing is poor. The breed is comparatively new and its characteristics not so firmly fixed as in some others. The cows are not heavy milkers, but are unexcelled for sections where rough pasture land must be depended upon for food.

Naturally enough brown Swiss cattle came originally from Switzerland, which is famous for its dairy products, especially cheese. This breed is in especially high favor in Russia, Germany, and Italy, but is also bred in fairly large numbers in this country. In color the brown Swiss resemble the Jerseys so closely that novices cannot distinguish between them. Brown Swiss can always be identified by a light stripe along the back. The cows are exceptionally friendly in disposition and are excellent for family purposes. They are rugged, thrive well on rough pasture lands, and give milk for an unusually long season.

No more picturesque cows are to be found in this country than the Dutch belted, which are black except for a wide band of white encircling the trunk. Holland is their home, and they are of medium size, easily handled, and well suited to sections where grain is expensive, for they have been found to do best on a light grain ration.

WHAT ARE THE ENGLISH BREEDS?

Devon cattle are sometimes called "rubies" because of their bright red coats. There are a dairy type and a beef type, for which reason they are classed as dual-purpose animals. They are docile, hardy, and will thrive on hilly pastures where Jerseys would find it difficult to get a living. As oxen Devons are especially desirable, being handsome, strong, and easily trained. Of course oxen are not used as commonly as in former years, when a pulling match was a feature of every little country fair, but they are still in demand. Devon cows of the dairy type produce only a moderate quantity of milk, but both the color and the quality are very good indeed. Originally the breed came from England, where the county of Devon has long been noted for its peculiar "red" cows.

The shorthorn is a very old and very important English breed. Formerly it was often called the Durham breed, from the county of Durham, and the name is still sometimes applied. The name shorthorn was given to distinguish the breed from a former formidable rival, the longhorn. This is a dual-purpose breed, there being both a dairy and a beef type.

Probably the shorthorn is the most widely distributed of all the breeds. There are certainly more individuals in the United States than of any other breed. In color shorthorns may be red or white or a mixture of the two. They are heavy animals, sometimes weighing fifteen hundred pounds or more. Shorthorns are excellent milkers, their one fault being that they are likely to go dry earlier than some other breeds. They take high rank among fanciers, and a single animal has sold for more than $40,000.

England has also given the world the red polled cattle, but the breed is new and not widely distributed. In the United States, Ohio is the only state which has a large number of these animals, which somewhat resemble the Devons and are raised for both milk and meat. Their coats may be any shade of red, and, as the word "polled" indicates, they have no horns.

WHAT BREED ORIGINATED IN CANADA?

In French Canadian cattle we have an American-made breed, developed in the province of Quebec. For a long time they were seldom seen outside that province, but now their unusual milking qualities are being recognized and they are spreading over the country. The cows are small and black, brown, or fawn in color. They are quiet but sturdy and show a surprisingly large percentage of profit on the value of the food they consume.

WHY ARE LEAVES GREEN?

LEAVES are green because they contain a peculiar green substance called "chlorophyll." This substance is very important to plants, for by its aid they are able to make their food, combining the carbon which they get from the air with the water which they get from the soil. The sugary substance resulting can be made over into any kind of food which the plant needs. (See Volume I, page 100.)

WHY ARE THE LEAVES OF ALMOST ALL PLANTS IN VERY WARM REGIONS EVERGREEN?

Because where there is no cold winter season the leaves can go on making food for the plant all the year.

WHY DO PINES BLOW OVER MORE EASILY THAN OAKS?

The root system of a pine is very shallow and runs near the surface of the ground, but that of the oak is deep and holds the tree very firmly.

WHY ARE BULLS DISTURBED BY RED?

Cattle have a keen sense of smell, but rather a dull sense of sight. Red is a conspicuous color against most natural backgrounds, and attracts the animal's attention as a strange living object. If a bull were to be kept in an inclosure which was painted red, so that a red garment was inconspicuous and a green one conspicuous, he would be more inflamed by the green than by the red.

IS A TIN PAN MADE OF TIN?

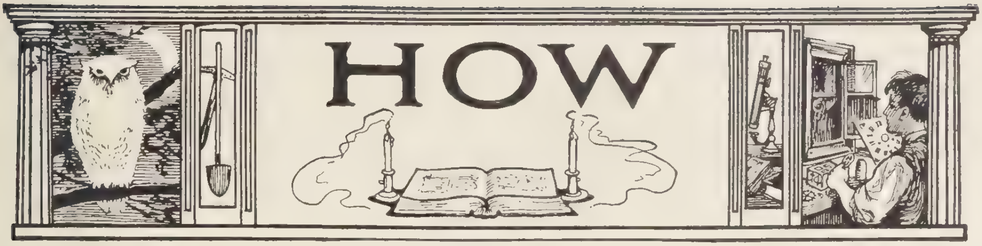
Only partly. Almost all pans are made of stamped sheet iron plated with a very thin coating of tin. The durability of the pan depends upon the thickness and number of the coatings of tin, as it is the tin alone that resists rusting.

WHY DO TELEGRAPH WIRES HUM?

Because there is almost always enough movement in the air to cause a tightly drawn wire to vibrate. A telegraph wire that has become slack will not hum.

WHY DOES A BASEBALL CURVE WHEN THE THROWER GIVES IT A SPINNING MOTION?

As the surface of a baseball is slightly rough, it carries a thin film or cloak of air with it, which rotates at a high speed. The scientist Bernouilli proved that when the speed of an air current was high, its pressure was low, and when the velocity was low, its pressure was correspondingly high. Because of the speed of the throw, the pressure of the air cloak is low. If the ball had no motion except that of an ordinary toss, this pressure would be equal on all sides. But if the ball is sent by the thrower with a motion that starts it spinning over and over, as it would in rolling down hill, the air passing over the top surface of the ball would tend to check the high speed of the enveloping film, while at the same time it tends to hasten the air film surrounding the lower surface. Then, according to Bernouilli, the air around the lower surface will be low in pressure because of its high velocity; the air above will be at high pressure because of its low velocity, and this slight difference caused by the manner of the throw will make the ball curve downward into the area of lower pressure where there is less resistance. If the rotation of the ball was in the opposite direction, it would curve upward. In the slight variations of throw in the hands of the baseball pitcher come the differences in air pressure which account, by this theory, for the curves.



HOW CAN YOU REMEMBER WHICH SIDE OF THE BOAT IS "PORT" AND WHICH IS "STARBOARD," AND ON WHICH SIDES THE RED AND THE GREEN LIGHTS BELONG?

BY remembering that left, port, and red belong together, and are all shorter than right, starboard, and green. Also by remembering that "Port wine is red."

HOW MUCH DOES THE OUTFIT OF A MODERN SOLDIER WEIGH?

The United States soldier carries a haversack, cartridge belt, and pack, which weigh all together forty-eight pounds. The haversack contains the rations, towel, toilet articles (comb, toothbrush, and soap), and the "mess kit," comprising knife, fork, spoon, and meat pan — a frying pan with lid that serves also as a plate. In the pack carrier are a blanket, half of a shelter tent, a raincloak with a hole in the middle, and a pair of socks. Then there is a bayonet in a scabbard, and the canteen and first-aid packet, with drinking cup fitted over the canteen bottom. The outfit is said to be the lightest and best yet devised.

HOW IS THERE A PERPETUAL SABBATH ON THE EARTH?

Because the Greeks observe Monday, the Persians Tuesday, the Assyrians Wednesday, the Egyptians Thursday, the Turks Friday, the Jews Saturday, and the Christians Sunday.

HOW DID THE AMERICAN EXPRESS BUSINESS ORIGINATE?

In January, 1839, William Frederick Harnden, a ticket master on the Boston and Worcester Railroad, while on a visit to New York, got the idea that he could make a living running errands for people between New York and Boston. He started with two valises, and soon had two messengers; and in 1840 he established a branch line to Philadelphia.

HOW MAY PHOTOGRAPHS BE SENT BY TELEGRAPH?

The photograph is first resolved into a series of fine parallel lines and printed in fish glue upon a sheet of lead foil. The picture is thus composed of masses of thinner or thicker lines of nonconducting glue with clear spaces between, representing the light and shade of the picture. This sheet is then wrapped upon a metal cylinder over which a stylus passes as it does in a phonograph. The cylinder or drum is set in motion and an electric circuit made through drum, stylus, and picture. Every time the stylus comes in contact with one of the fish-glue lines the circuit will be broken. A similar receiving instrument is set up with a revolving drum and the two are connected. But in the receiving instrument the drum is wrapped with a piece of absorbent paper, soaked in a colorless solution until it has the property of being decomposed whenever an electric current passes through it, turning the paper black or brown.

When the sending apparatus is set going, it will begin to send out over the wire a current broken into little "dashes" where the stylus has come up against a line of fish glue. Each little dash of current will make a similar current pass through the prepared paper, leaving behind it a mark identical with that on the original photograph. As it is possible to make two hundred of these minute dashes a second, the picture can soon be completed, an exact reproduction of the original except for a slight ruling due to the division of the original into a large number of parts.

WHAT IS THE MEANING OF THE PHRASE "A ROLAND FOR AN OLIVER"?

A BLOW for a blow, a retort for a retort. Roland and Oliver were two famous knights of Charlemagne's court, so nearly matched that they fought for five days without either getting the better of the other. Hence the expression.

WHAT MAKES AN OAR LOOK BENT IN THE WATER?

See Volume I, page 100.

WHAT HAPPENS WHEN SILVER TARNISHES?

See Volume I, page 185, under "Why is Gold Used for Coins?"

WHAT IS THE COST OF A MODERN VESTIBULE SLEEPING CAR?

At least from $17,000 to $20,000; while an ordinary passenger coach costs about $4500.

WHAT HAS MADE THE MODERN AUTOMOBILE POSSIBLE?

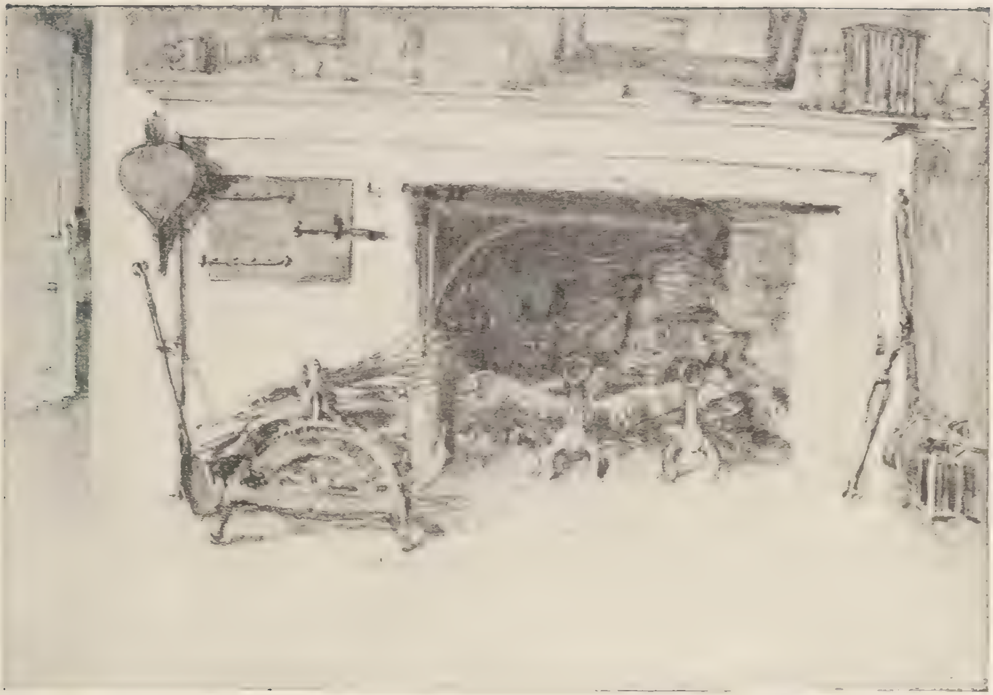
See Volume II, page 115.

WHAT NICKNAMES HAVE BEEN GIVEN TO STATES OF THE UNION?

Alabama — Cotton State.
Arkansas — Bear State.
Colorado — Centennial State.
Connecticut — Nutmeg State.
Delaware — Diamond State, Blue Hen State.
Florida — Peninsular State.
Illinois — Sucker State, Prairie State.
Indiana — Hoosier State.
Iowa — Hawkeye State.
Kentucky — Blue Grass State.
Louisiana — Pelican State, Creole State.
Maine — Pine Tree State.
Maryland — Old Line State.
Massachusetts — Bay State, Old Colony.
Michigan — Wolverine State, Lake State.
Minnesota — Gopher State.
Mississippi — Bayou State.
New York — Empire State.
New Hampshire — Granite State.
North Carolina — Turpentine State, Old North State.
Ohio — Buckeye State.
Pennsylvania — Keystone State.
South Carolina — Palmetto State.
Tennessee — Volunteer State.
Texas — Lone Star State.
Vermont — Green Mountain State.
Virginia — Old Dominion.
West Virginia — Panhandle State.
Wisconsin — Badger State.

WHAT ARE THE LEADING NICKNAMES OF SOME OF THE LEADING CITIES?

Boston — The Hub. New York — Gotham. Philadelphia — Quaker City, City of Brotherly Love. Baltimore — Monumental City. Brooklyn — City of Churches. Washington — City of Magnificent Distances. Chicago — Garden City. New Orleans — Crescent City. Cincinnati — Queen City. Buffalo — Queen City of the Lakes. Cleveland — Forest City. Detroit — City of the Straits. Minneapolis — City of Flour. Rochester — Flour City. St. Louis — Mound City. St. Paul — Gem City. Toledo — Corn City. Salt Lake City — City of the Saints. San Francisco — Golden City, Golden Gate. Pittsburgh — Iron City. Duluth — Zenith City. Indianapolis — Railroad City. Milwaukee — Cream City. Louisville — Falls City. New Haven — Elm City.



By permission of Helen B. Mason

WHEN YOU PLAN YOUR HOUSE

IN one of his essays Lord Bacon writes, "He that builds a fair house upon an ill seat, committeth himself to prison," which is simply another way of saying that location is of first importance. A pleasant outlook is a never failing source of inspiration and always to be taken into account when planning the position of the living rooms. At the same time, exposure to the sun and to the prevailing winds must be considered. It is most desirable to have a dining room which receives the morning sun and a living room which is flooded with sunlight in the afternoon. The porch should preferably be shaded from the afternoon sun in order that it may offer a cool retreat on a hot summer day. When possible, the rooms most occupied should be sheltered from the high winds of winter, especially in the country. It is an advantage to have windows on two or more sides of a room, and well-established cross currents of air should be provided for in the kitchen — an expedient which aids in keeping that room cool.

WHAT IS THE BEST MATERIAL?

One point to be settled at the beginning is the character of the material to be used. Location will enter into the question. In some sections it is as cheap to build with brick as with wood. In other places cement houses cost but little more. In general, however, the frame house is the least expensive and is most often the choice of the home builder. A house of wood is always dry, and if properly constructed is warm in winter and cool in summer. Wood lends itself freely to architectural expression. A frame house may have an exterior covering of clapboards, shingles, or siding.

Brick, stone, and cement houses require fewer repairs — an important item. The saving in paint alone is considerable. When these materials are used, cheap construction must be avoided or the houses will surely be damp, chilly, and uncomfortable. A brick house should be furred and lathed before plaster is applied to

the inside walls. It is also wise to waterproof the wall by painting it with ready-made chemical preparations.

Houses of brick veneer are really frame houses surfaced over with brick. While they look like brick houses when finished, they are built for the most part exactly like houses of wood, but they are less likely to be damp and cold than a house with walls of solid brick. Modern bricks in varying tones and soft texture are a great relief from the brick of other days. Rough bricks and even paving bricks are now often employed, and pleasant effects are secured by using Flemish or English bonds, or other overlapping arrangements and by making wide, deep mortar joints.

Of late years cement plaster has come into very general use, and is applied to ordinary frame houses and to houses built of hollow tile. It must be remembered that cement is decidedly absorbent. If the house is to be dry, waterproof felt must be placed next to the underboarding. Sometimes it is also necessary to apply a coating of waterproof material to the outside walls. The plaster is laid on wood or metal laths and may be finished smooth or rough. Probably rough finish is the better, and really to look well such a house should have painted trimmings carrying considerable color. Stained shingles are often desirable. It is by no means easy to handle cement houses artistically, and in the hands of incompetent architects they are likely to look far from homelike and inviting.

Hollow tile is one of the best building materials yet devised, although when plastered over its good points may be lost to the eye. A house of this material is always dry and little affected by weather changes. Plaster may be applied directly to the tiles, and if a tile or asbestos roof is used, the risk from fire is minimized. Cement blocks, which are used to some extent in house building, are so regular and so uniform in color and texture that they are the despair of any builder who attempts to construct with them a house with any architectural merit.

INSIDE THE HOUSE

There is little to be said in a general way about the floor plans, but some special features are well worth attention. The day of the old-fashioned parlor has passed, and the well-planned modern house has a large, rectangular living room, with a fireplace of generous proportions at the end or at one side. It is desirable to have windows on three sides, and it is an excellent plan to have French doors leading to a porch. It is far better, by the way, to have the porch at one end of the house rather than across the front, especially if it is a covered porch, for otherwise it will tend to darken the rooms to an uncomfortable extent. Porches with awnings which may be raised when desired in summer and removed in winter have certain merits.

Many modern houses, especially those of the bungalow type, are so arranged that one enters the living room directly from the entrance porch; but this is objectionable, for visitors must then be ushered directly into the apartment where the entire family may be assembled and where a certain degree of privacy is most desirable. It is much better to arrange for a small hall or for a little reception room, where the caller, who may perhaps have only a business errand, will not be submitted to the embarrassment which he must necessarily feel when he finds himself intruded into the family circle.

The large dining room has passed out with the unlamented parlor. If the family is small, this room may well be nearly square, but otherwise it should be rectangular. There should be ample room for service. Often increased space may be obtained by the construction of a bay window on one side. It may be wise to set the sideboard in the bay, with a wide, narrow window above it. If it gets the morning sun, a bay window in the dining room is an advantageous location for house plants. Fireplaces are cheerful adjuncts to all apartments, but they should be barred from the dining room unless that room is fairly large, for the guest who sat next the fire would be certain to find the heat decidedly uncomfortable.

With some people a butler's pantry is a fetish; yet it is quite an unnecessary expense in the average house, for the average housekeeper has no butler to "buttle" in it. A small serving cupboard, with a door at each end, is useful, for if it contains cupboards and drawers, many steps will be saved, and the double doors aid in

ATTRACTIVE DOORWAYS WITH SLEEPING PORCHES, AND A CORNER OF A LIVING ROOM

preventing odors and noises from reaching other parts of the house. It is very convenient to have a little sink, for washing china, in this serving cupboard.

Well-planned modern kitchens are not more than half as large as those which were to be found in old-time houses. A room ten feet by twelve is perfectly feasible if well arranged, especially if the cooking is done on a gas range. A coal range may very well be dispensed with if a pipe from the furnace or heater is run to the kitchen. Built-in kitchen cupboards save space and are convenient. It is also desirable to have a built-in refrigerator, or at least to have the refrigerator stand in an alcove away from the stove, and to have it so arranged that it may be filled from the outside of the house.

It is important to have the sink in front of a window and in convenient juxtaposition to stove and cupboards. It would be difficult to persuade some housekeepers that a pantry is not essential; yet they are being dispensed with without the loss being seriously felt. Even when pantries are demanded, it is the part of wisdom to have them small, for they must be kept clean, and the larger they are the more attention they demand.

It is a great help to the housewife to have a small shed close to the kitchen, as many steps up and down stairs will be saved. A small back porch should be provided if possible, and the rear door should have a window set in it, so that applicants for admission may be seen before the door is unlocked. It is also well to have an outside electric light, governed by a button inside the house.

When the bedrooms are being planned, it is important to indicate the wall spaces to be devoted to the different articles of furniture. It is embarrassing to find, when a house has been completed, that the beds must project beyond the windows or else block a closet door. There should be a well-lighted spot for the dresser, with ample room in front. The placing of doors in the middle of wall spaces is something to be avoided so far as possible. A full-length mirror set into a closet door is an interesting and useful feature. Large bedrooms are not at all necessary, but it is better to have them oblong rather than square, and with windows on opposite sides in order to obtain cross currents of air.

It is very important to have a bathroom which is easily reached from all the bedrooms. When there are many in the family or servants, two bathrooms are imperatively needed. Indeed, four or five people are as many as one bathroom should be expected to serve. Lavatories in the bedrooms will help to provide accommodations for all, and it is quite possible to have them inclosed in the walls. The ideal bathroom has glazed tiles on the walls and unglazed tiles on the floor, although plastered walls covered with enamel paint are sanitary. The housekeeper finds it convenient to have a series of drawers built into one side of the bathroom. Every well-planned house will have several commodious closets, one at least with drawers at the bottom. It is desirable to have an electric light in each closet, and also to have one closet with an outside window, where clothing may be aired. Wardrobe closets should be provided with rods for hangers and a shelf above for hats.

If the housewife is wise, she will have a large cupboard in the basement for storing preserves and similar delicacies, with broad, adjustable shelves and tight doors. The basement should have a cemented floor by all means, and it is well to have an asbestos ceiling over the furnace. The basement is usually a better place for the set tubs than the kitchen, and it is better to have the tubs detached than close to the wall. It is very convenient to have a laundry chute from the bathroom to the basement.

Much labor would be saved if all houses were built with dust-proof coal bins, which are quite possible to construct if sheathing paper is placed between two layers of boards. Sometimes cement bins are constructed.

WHAT IS THE BEST TREATMENT OF THE ROOMS?

The general tendency in these times is to build houses with fewer doors than in olden days, when the heating problem was more difficult to solve. Doors are often dispensed with entirely between such rooms as the hall, the living room, and the dining room. When this plan is followed, a uniform decorative scheme is needed. This does not mean that the walls of all the rooms should be treated just alike, but the colors used should blend harmoniously and sharp contrasts should be avoided. This is

A BOY'S ROOM, AND A HALL WITH A GRACEFUL STAIRCASE

particularly true when the house is small, for by this expedient the rooms are made to appear much more spacious than is actually the fact. The walls may be papered, covered with fabric, or painted. Some of the cold-water paints on the market come in a great variety of shades, are inexpensive, and give a pleasant soft finish. Decorator's canvas is sometimes glued to the wall and painted, and the use of burlap is common. When plain shades are used on the wall, it is effective to have draperies of cretonne or other figured materials. Plain hangings are preferable when a paper with a pronounced figure is chosen. If oak furniture is to be used, the woodwork may be painted the same shade, but for mahogany furniture it is better to have the woodwork painted white.

Whatever the window hangings, particularly striking results are to be obtained when the windows are grouped, and the effect from the outside is likely to be good. Casement windows are very decorative and have come into wide popularity. It is better to have them swing out rather than in, for then they do not interfere with the draperies; but strong rods should be employed to hold them open or they will be torn loose by sudden gales. Modern controlling rods are manipulated by means of handles in the sill, and it is not necessary to raise the screen in order to open or close the windows.

WHEN WAS CONCRETE INVENTED, AND HOW IS IT MADE?

See Volume II, page 110.

WHERE DID WE GET OUR STYLES OF ARCHITECTURE?

See Volume IV, page 215.

IN WHITTIER'S MASSACHUSETTS HOME

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IN THE WHITE HOUSE

The Red Room, and the entrance corridor, showing on the floor the seal of the President.

Copyright, Harris & Ewing

IN THE WHITE HOUSE

The East Room and the dining room.

WHEN WAS THE WHITE HOUSE SO NAMED?

THE first "Executive Mansion" was begun in 1792 and was occupied by President Adams in 1800. It was built of freestone and was unpainted. In 1814 it was burned by the British, but was rebuilt. In order, it is said, to cover the signs of the fire on the walls which remained standing, it was painted white. The people began to call it the White House, and it has been known by that name for one hundred years, though several Presidents have tried to give it a more dignified and formal title.

When "Dolly" Madison, wife of the President, received from her husband the message that she must leave the White House because the British were coming, the story is told that she tore from its frame the Gilbert Stuart portrait of George Washington (see Volume VIII, page 352), saying as she gave it to friends to keep, "Take care of that, but destroy it before you let it fall into the hands of the British."

WHERE ARE GLASS-BOTTOMED BOATS USED?

In Avalon harbor, Catalina Island, California, where the water is so clear that you can see to the bottom.

WHO SAID, "I WOULD RATHER BE RIGHT THAN BE PRESIDENT"?

HENRY CLAY, when he was remonstrated with because he was warmly indorsing a measure which might interfere with his political chances.

WHO SAID, "HOLD THE FORT FOR I AM COMING"?

This was a famous message telegraphed by General Sherman to General Corse, October 5, 1864, to assure him that he would soon be reënforced.

WHO WROTE, "TO ERR IS HUMAN, TO FORGIVE DIVINE"?

Alexander Pope, in "An Essay on Criticism."

OF WHOM WAS IT WRITTEN, "WHO NEVER SAID A FOOLISH THING AND NEVER DID A WISE ONE"?

Charles II of England.

WHO SAID, "TO SINK OR SWIM, LIVE OR DIE, SURVIVE OR PERISH WITH MY COUNTRY IS MY UNALTERABLE DETERMINATION"?

John Adams, the second President of the United States and one of the framers of the Declaration of Independence, used these words when he explained to his Tory friends that he must henceforth aid the colonies in their struggle against England.

WHO ARE THE WORLD'S GREATEST POETS?

Homer, Virgil, Dante, Goethe, Shakespeare, and Milton.

WHO SAID, "SPEAK, GOOD MOUTH"?

When Queen Elizabeth went on a visit to Bristol, she was met by the mayor, who was to offer to her the homage of the citizens. Now the mayor was a shy man and was much overwhelmed at the honor that fell to his lot. Approaching the Queen he began: "I am the mouth of the town." Then there was an awful pause; he had forgotten what he intended to say next. The Queen waited a moment, then completed his discomfiture by remarking, "Speak, good mouth."

WHO MADE THE FIRST SANDWICHES?

The Earl of Sandwich in England, who was so great a gambler that, in order to save time, he is said to have formed the habit of putting a piece of meat between two slices of bread, which he could eat without leaving the gaming table. Hence, so the story goes, the name "sandwich."

WHO WAS THE ORIGINATOR OF THE LIFEBOAT IN AMERICA?

Joseph Francis (1801–1893). He was born in Boston and died in Washington. Congress voted him a medal of pure gold in 1890. His original life-car, which saved two hundred and one lives from the wreck of the *Ayrshire* on the New Jersey coast in 1850, is on exhibition in the National Museum. People laughed when it was made, as they did at his idea that a corrugated iron boat could be made that would float, since everybody knew iron would sink in water.

WHO INVENTED THE FRICTION MATCH?

See Volume II, page 273.

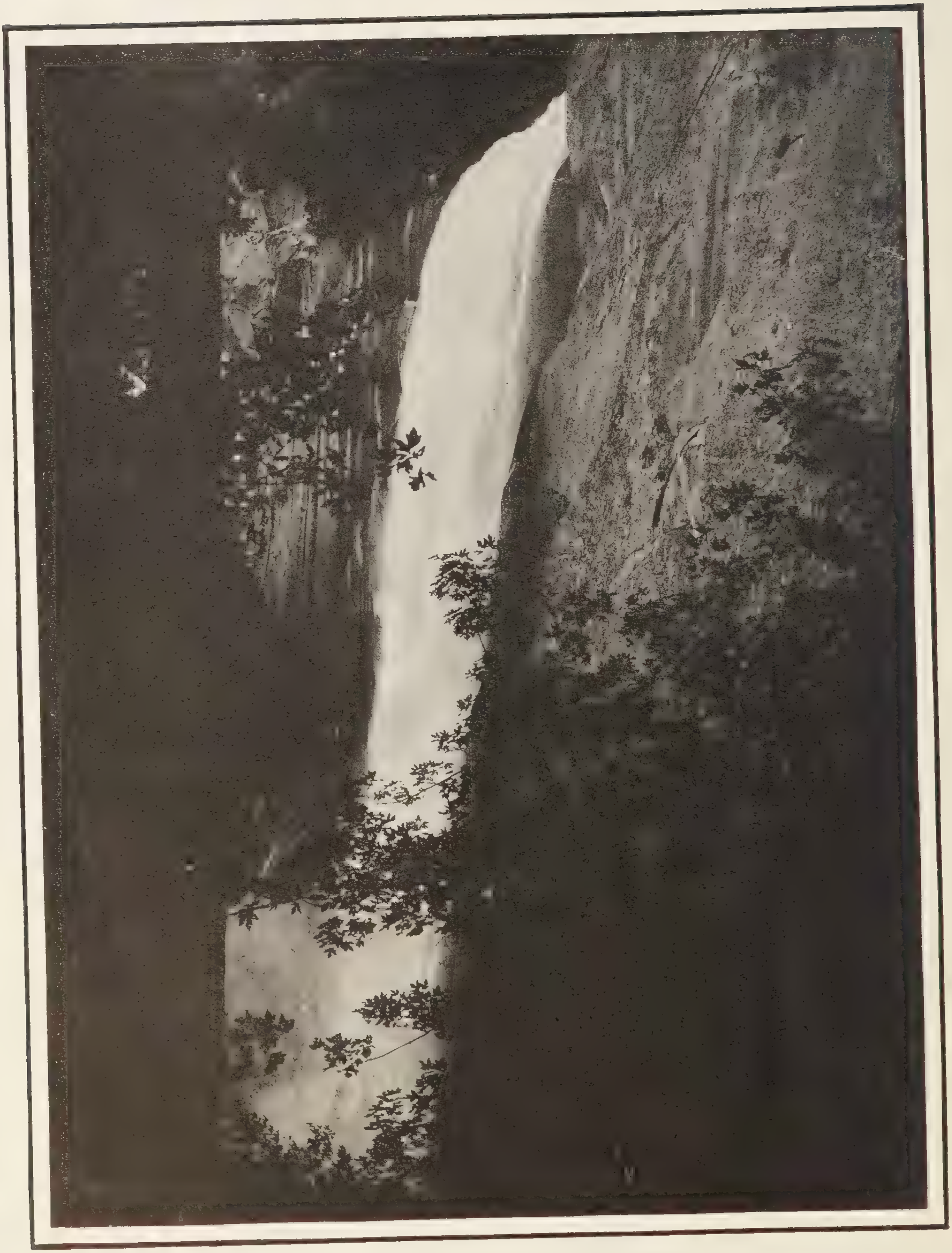
IN THE GARDEN OF THE GODS, COLORADO

THE NATION'S PLAYGROUND

OUR NATIONAL PARKS

IN the vast expanse of the United States there are more great natural scenic wonders than may be found in any other one country in the world. By a wise foresight of the Congress of the United States vast areas of public lands in which are contained many of these marvels of Nature have been set aside and reserved for the use of all the people of the nation. As a result we, the citizens of the United States, own nearly five million acres of land that is ours for pleasure and recreation exclusively, free from all incursions of commerce and industry. These areas are distributed in national parks, the largest of which, the Yellowstone, in the states of Wyoming, Montana, and Idaho, comprises over two million acres, and the smallest, Sully's Hill, in North Dakota, seven hundred and eighty acres.

The practice of setting aside these tracts of land was begun in 1872 by the establishment of Yellowstone National Park, noted especially for its mountains, cañons, geysers, waterfalls, trails, and wild animal life. Hot Springs, Arkansas, was set apart in 1880, for its medicinal springs. Yosemite National Park, Sequoia and General Grant parks, California, were all established in 1800, the first for its unique glacial valleys, high promontories, and beautiful waterfalls, the others especially for their great trees. Mount Rainier Park, Washington, was chosen in 1899 for its beautiful snow-capped mountain peaks and its glaciers;



BRIDAL VEIL FALL, YOSEMITE VALLEY, CALIFORNIA

For the story of other remarkable cataracts, see Volume I, page 160.

LOOKING INTO THE GRAND CAÑON OF THE COLORADO RIVER

Crater Lake, Oregon, in 1902, for its lake at a great altitude in the basin of an extinct volcano; Wind Cave, South Dakota, in 1903, for its caverns, somewhat similar to those of Mammoth Cave in Kentucky; Sully's Hill, North Dakota, in 1904, for its wooded hills and lake shores; Platt, Oklahoma, in 1902 and 1904, for its springs; Mesa Verde, Colorado, in 1906 and 1913, for its prehistoric cliff houses; and Glacier National Park, Montana, in 1910, for its glaciers, now in action, and its primeval forests. Among those set apart more recently are Rocky Mountain, Colorado, in 1915; Hawaii, Territory of Hawaii, in 1916; Lassen Volcano, California, in 1916; Mount McKinley, Alaska, in 1917; Grand Cañon, Arizona, in 1919; Lafayette, Maine, in 1919. As time goes on more districts will be set aside, until our great national wonders are all freed from the danger of commercial exploitation.

HOW ARE THEY ADMINISTERED?

To the Department of the Interior, which is the custodian of most of the federal public lands, has been delegated the jurisdiction over and administration of all of the national parks; that is, all those so designated for scenic purposes. There are a few military parks, the cemeteries for the soldiers killed in the war between the states, that are administered by the War Department; such, for instance, as Gettysburg in Pennsylvania, Chickamauga in Tennessee, and Vicksburg in Mississippi. The Secretary of the Interior is for all practical purposes the greatest superintendent of parks in the world. He and his assistants must estimate the amount of money necessary to recommend to Congress at each session to be appropriated for their maintenance, aggregating many hundreds of thousands of dollars. To him are referred by Congress for favorable or adverse reports all propositions, and they are many in number, for the creation of new parks. He selects the subordinate superintendents for most of the parks and has direct supervision over all of them. He gives permits for such concessions as the operation of hotels and camps and coach lines in the parks. From these concessions are realized quite large sums of money to the government, of which he must give a careful accounting.

The policing of the parks is assigned to the army of the United States, and in some of the larger parks, such as the Yellowstone and the Yosemite, an officer of the army, usually a colonel or a major in active service, is named as superintendent, although while on such detached service he reports to the Secretary of the Interior as his chief in all matters relating to park administration.

WHAT ARE NATIONAL MONUMENTS?

In addition to the national parks, the nation possesses areas of great historic and scientific interest, designated as "national monuments." By an act of Congress, July 8, 1906, the President is authorized "in his discretion to declare by public proclamation, historic landmarks, historic and prehistoric structures, and other objects of historic and scientific interest, that are situated upon lands owned or controlled by the government of the United States, to be national monuments." Unlike the parks, not all of the monuments are administered by the Department of the Interior. Some, for their forestry features, have been assigned to the Department of Agriculture, and are immediately under the direction of the Forest Service; and others, to the War Department.

Among the national monuments are many ruins of historical interest and value as well as scenes of natural beauty. The petrified forests in Arizona, caverns, cañons, cliff dwellings, and natural bridges in Arizona, New Mexico, Wyoming, Oregon, and Utah, are among the other monuments reserved, with a district set apart in 1910 at Sitka, Alaska. Some of these will in time doubtless be transferred to the list of national parks. Indeed, the list of national possessions is constantly increasing; but if we have an idea of the nation's policy, and of its purchases during the first forty years of its carrying out of this policy, we can follow the details from time to time.

According to the records of the Secretary of the Interior, the American people have been slow to wake up to their privileges of ownership in this great playground; but it is safe to predict that in the course of the next few years the tide of travel to the American parks will rise to very great proportions.

THE WORK OF THE UNITED STATES FORESTRY SERVICE

At the top is shown a mountain stream in a forested region, and a forest ranger gauging a stream; below, men clearing away underbrush to prevent fires, and a barren deforested region.

BYPLAY ON THE PIANO KEYBOARD

[Every one of us, however little he may know of music, knows the piano keyboard and the scale. Professor Leo Rich Lewis, head of the Department of Music, Tufts College, makes these the starting points for an interesting story of musical beginnings.]

THE piano keyboard, like so many common things "about the house," is a wonderful affair. It is not so very ancient; indeed, in some respects it is rather new. It took on its present arrangement, after a good deal of experimenting, about the time America was discovered. But hardly fifty years have elapsed since it became definitely settled as to range. Several inventors have tried to "improve" it; however, not many people have been found who cared to adopt the improvements. It would seem that the keyboard is now established forever.

HOW THE KEYBOARD HAS INFLUENCED THE PRINTING OF MUSIC

One of the things that makes us pretty sure of this is that other devices have grown out of the keyboard. We can call musical notation one of those devices. If anyone supposes the violinist's convenience is best served by the ordinary method of printing music, he is quite mistaken. A much better method of notation could easily have been devised, adapted to the tuning of the strings. As to the singer, the learning of the meaning of the printed signs is so difficult that several simplified systems of vocal notation have been introduced. But everybody finally has to become familiar with the "regular, old-fashioned notation." In other words, this keyboard, this clever device that grew out of the desire to play several notes together, this handle of the commonest tool of music, has made every musical instrument conform to it, including the human voice, and not excepting even the drums. As a result, most of the players in an orchestra have to spend a long time in learning the meaning of certain musical signs, merely because music as a whole can best be gotten at, by the ordinary individual, through the keyboard. You perhaps cannot say that Tom, Dick, and Harry have thus settled notation, but it may be said that Thomas, Richard, and Henry did. In fact, music has been the people's art in a very real sense. What those in authority — the high-class experts — wanted has never had very much to do with anything except the "frills" of music.

WHAT IS TONALITY?

And so it comes about that, with keyboard at hand, we can observe — or, so to speak, we can *re*discover — some of the underlying principles of music. For instance, merely by depressing the white notes in succession we can clearly make out the great, splendidly simple fact of tonality. This word has a rather forbidding technical sound. If the English language were made up on the plan of some other languages, I suspect that we should be able to say "keyishness" instead of tonality. Now music has to be "keyish" in order to be music at all. It might seem bookish to talk about tonality; but when we take a little glide up or down the keyboard, we are bound to find out what "keyishness" is. Or perhaps you would call it "scaleishness." Whatever you call it, you recognize the fact that every so often, and with regularity, you arrive at a kind of rest point. And that means that there are key tones. To have key tones is to have tonality.

THE SCALE, AND WHAT IT MADE POSSIBLE

The rest point is the most obvious part of a great human mystery, the scale. If we examine a bit further, we find that there are, between these rest points, some tones which are arranged in a kind of magic order. We promptly recognize the arrangement, and learned people can tell us why the tones *probably* had that arrangement. But all of everybody's knowledge about the why and the wherefore does not help anybody to find a beautiful new melody or an attractive or significant chord. The scale was like Topsy — it just grew. And all the lovely and powerful music in the world became possible as soon as the scale had grown, and nothing

much more expressive than monkey chatter could be gotten out of music until the scale settled itself thoroughly in the human consciousness.

Our object just now is not to tell a long technical story about the facts and signs of music, as it is played and sung and written down. There are plenty of books about "The Rudiments of Music" and "The Elements of Musical Theory." The trouble with some of these books is that they do not make us think at all about the wonders of the things they describe. Probably, if they did, we should call them sentimental and stupid. But just think, now, what a clever thing it was to make this scale the basis of the keyboard; to discover the possibility of putting in some intermediate tones (the black notes give them to us); and then to find out, just when the greatest of all musicians, John Sebastian Bach, was ready to work it all out in all its possibilities, that you could have "keyishness" starting from any tone as your rest point. How the art did leap ahead then! Players had to work very hard to keep up with the procession of composers.

As we have said, long and intricate talk about sharps and flats and other things is not what we are undertaking now. Let us take a big leap to one of the most puzzling matters of printed music and see that this, like many another much simpler point, can be made clear by realizing that the universal device — the keyboard — provides that everything should be made consistent from its standpoint.

Suppose that we start our scale on F. It runs along very nicely. We play F G A, then a certain kind of a B, then C D E F. But if we start it on F-sharp, we play, as we come near the end, C-sharp, D-sharp, and then — well, what then? We play a white note which we called F a moment ago. But that seventh tone is not some kind of an F; it is some kind of an E. And we call it E-sharp, realizing that it is no more surprising that a white note should

BELLS ASSOCIATED WITH WORSHIP DATE BACK TO ANCIENT TIMES

With the drum, the pipe, and the lyre, bells share the honor of being the oldest musical instruments.

have two names than it is that C-sharp should sometimes be called D-flat.

You probably have had that dazed feeling that comes when you get well into the midst of a hard "sum" in arithmetic. I have seen some grown-up people who seemed to have that feeling when, as they might have expressed it, one "begins to call white notes black." But that is because they have learned their music lessons in parrot-like fashion, and have never realized that the mysteries of music are all in its power and beauty, not in its representation. The piano keyboard is indeed a wonderful affair, but its chief feature is its helpfulness in solving some problems of notation that look like riddles until we find out that what is on the page did not make the keyboard, but was made by the keyboard.

Leo R. Lewis

WHAT IS THE PART OF EACH INSTRUMENT IN AN ORCHESTRA?

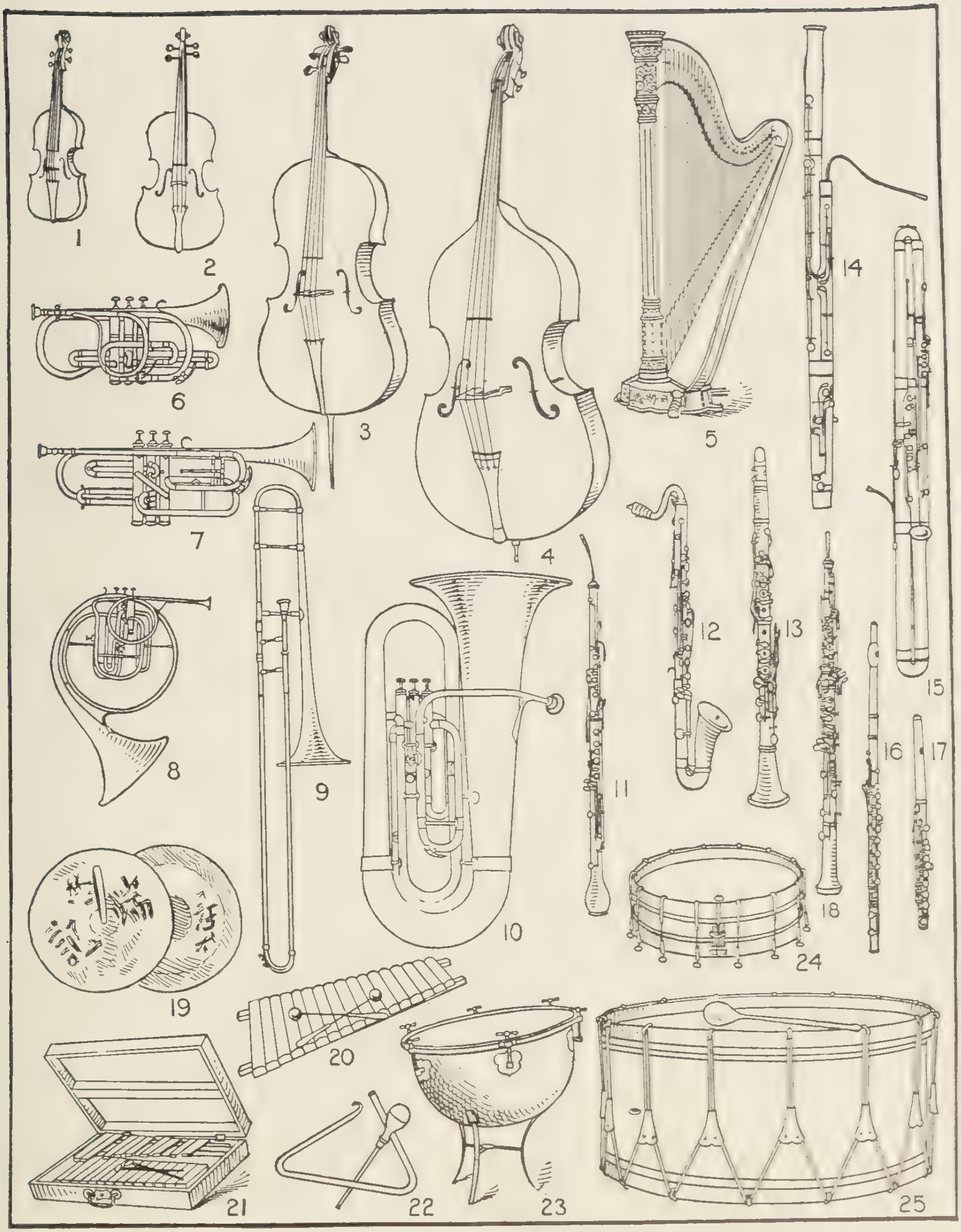
The instruments of an orchestra group in four main classes, known in musical diction as "strings," "wood winds," "brasses," and "percussives." The string instruments are the violin, viola, violoncello, and double bass; the violin, which is considered the main instrument in the orchestra, usually carrying the theme, while the others take the places respectively of alto, baritone, and bass voices. This group of instruments is sometimes used alone to make up a string orchestra.

Of the wooden wind instruments, blown by the breath, the clarinet occupies the position of second voice to the violin, used chiefly for obbligato passages, while the oboe, English horn, and bassoon have a somewhat different tone color, lending themselves more to weird and mournful effects. In this group the oboe is the soprano; the English horn, the alto; and the bassoon, the bass voice. The flute and piccolo are also of the wood-wind kind, but of a somewhat different character, their tone being produced by direct wind pressure instead of with the assistance of a reed, as in the case of the clarinet. The flute occupies a place second only to the violin or clarinet, with special adaptation to the more mellow passages, obbligati, etc. The piccolo brings out a birdlike quality with very high notes, and is indispensable in a climax.

The brass instruments are arranged in the following order: the tuba, representing the bass voice; the trombone, the tenor; and the trumpet or cornet, the soprano. The French horn, which is the alto of this family, has a more refined quality of tone than any of the other brass instruments. It is used for the more mellow and harmonic passages and for distant effects, leaving the other brasses to give vigor and weight to the orchestra.

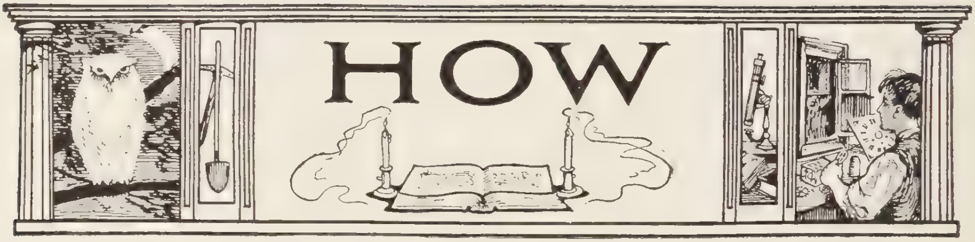
Members of the drum family, cymbals, and tympans, with orchestra bells, triangle, and xylophone, are what are known as the "percussives" or battery of an orchestra, the former group giving the heavy effects, the latter used for bell-like and brilliant passages.

In high-class orchestras the harp is often used, chiefly for solo work and arpeggios; its notes are characterized by a rippling sweetness.



WHAT ARE THE INSTRUMENTS OF AN ORCHESTRA?

1. Violin. 2. Viola. 3. Violoncello. 4. Double bass. 5. Harp. 6. Cornet. 7. Trumpet. 8. French horn. 9. Trombone. 10. Tuba. 11. English horn. 12. Bass clarinet. 13. Clarinet. 14. Bassoon. 15. Bass bassoon. 16. Flute. 17. Piccolo. 18. Oboe. 19. Cymbals. 20. Xylophone. 21. Orchestra bells. 22. Triangle. 23. Tympan. 24. Drum. 25. Bass drum.



HOW ARE PARROTS TAUGHT TO TALK?

When a parrot is given a lesson, the trainer takes a position in front of the cage and persists with a constant reiteration of the words and phrases which it is desired to have the bird learn. This may be kept up day after day for weeks before the pupil "finds its tongue." Then, suddenly and apparently to its own surprise, it discovers its curious ability to articulate.

In talking to the pupil, the teacher speaks very distinctly, in a somewhat high voice, and with slight pauses between each word. If the parrot develops a tendency to scream or make harsh noises, it may be checked by tapping lightly on the cage with a pencil or by blowing in the bird's face. Some trainers throw a cloth over the cage when the first lessons are given. Others use a speaking tube which is carried through a hole pierced in the wall between two rooms. The teacher stands

Courtesy, Progressive Education, New York

CHILDREN MAKING THEIR OWN INSTRUMENTS FOR THEIR ORCHESTRA

See also Volume Nine, pages 346–352.

in one room, while the cage of the bird is set in the other. Late in the afternoon is said to be the best time for giving instruction, and a lesson period should last about twenty minutes.

HOW FAR CAN A FLY FLY?

Marked flies have been known to go as far as a thousand yards, when there was no food in sight nearer. Seven or eight hundred feet seems to be their common record, but again and again they have been proved to have traveled three to four hundred yards.

HOW DO FLIES WALK ON CEILINGS WITHOUT FALLING OFF?

Their feet are provided with moist, hairy pads which can stick to any smooth surface. For rough surfaces each foot is provided with a pair of hooks.

HOW CAN THE MOUTH OF THE MISSISSIPPI BE HIGHER THAN ITS SOURCE?

The source of the Mississippi is so far north that it is in the region where the flatness of the poles begins. Accordingly this region is not so far from the earth's center as the region so much farther south, at the mouth of the river.

HOW DO BEAVERS GET THEIR FOOD?

By gnawing off the bark of hardwood trees, which is their main article of diet. They will even gnaw through the trunks and float them out to the doors of their houses for a winter supply of bark.

HOW CAN THE JAPANESE KEEP WARM IN PAPER CLOTHES?

The paper used for clothing and protection against the cold in some parts of Japan is not porous and so keeps the warmth of the body from passing through it.

WHAT ARE THE MODERN WONDERS OF THE WORLD?

THE ancient wonders (page 124) were chosen chiefly for their size and general magnificence. Of them all only one, the lighthouse of Alexandria, was of any practical service to mankind. In 1912 the editor of "Popular Mechanics" conceived the idea of a list made up on a different plan, representing the wonders of man's achievement in science. Several hundred American and European men of science were invited to select what were to them the seven wonders, and this, in the order named, was the result of their votes: Wireless telegraphy, the telephone, the aëroplane, radium, antiseptics and antitoxins, spectrum analysis, and the X-rays. Refresh your memory about each of these wonders by reading their story in these volumes of "Our Wonder World" and see if your choice would be the same. Then think over a list of building and engineering achievements, such as are grouped in Volume IV, which would be headed by the Panama Canal, which, by the way, was the eighth on this modern list. One thing you will notice in every case: almost every one of our modern wonders has benefited the human race, and all were discovered and developed by the power of the human mind, not chiefly by brute strength.

WHAT IS THE HORSE POWER OF A LIGHTNING FLASH?

A mathematician has reckoned that the amount of light given by a single lightning flash is sufficient to light an area two miles square with an average illumination of one candle. To produce such an illumination over so large a territory for one second would require the expenditure of thirteen thousand horse power.

WHAT MAKES THE SAP RISE IN TREES?

Capillary attraction, to a great extent. But what is capillary attraction? A force which is not very clearly understood, as it seems to contradict one of the great laws of Nature; namely, that water will not flow uphill. But it is not really a contradiction of that great law after all; instead it is an example of what happens when two natural laws come into contact with each other. The other law is the law of attraction, the law which holds the earth together and makes apples drop from the trees and all other things tend to fall to the ground. This power of attraction is shown when you put a small glass tube into a glass of water, for you will notice that the water inside the tube stands at a higher level than the water outside. The sides of the tube attract the water strongly enough to make the water climb up it a little way, and the smaller the tube the farther the water will climb. If you leave one corner of a towel lying in a washbasin full of water, you will find that before long the water will climb up into the towel and out on the table. The water in the tube and the water in the towel are drawn up by capillary attraction.

When the soft bark of a tree begins to swell in the spring, it acts just like the towel in the washbasin and draws the moisture up out of the ground into the tree and its branches and right out into the leaves.

WHAT ANIMAL HAS ONLY A MILLIONTH OF A CHANCE OF GROWING UP?

The baby oyster has so many enemies from the time it is born until it becomes attached to some object for the rest of its life, that this estimate of its chances for survival has been found to be true.

BEHIND THE SCENES

IN THE POST OFFICE

WHEN YOU MAIL A LETTER

DID you ever wonder when you dropped a letter in a box what would happen to it in the course of the next few hours? Let us follow a letter mailed in a city box and see what actually takes place.

It is collected by a carrier and carried to the post office, where it is poured out of the bag in which it has been collected on what is called the "facing up" table. There all the letters are arranged with the address side uppermost and are fed into a machine which cancels the stamp and prints the postmark with the place and date.

Next clerks take all the letters, including the one in which we are particularly interested, to assorting tables, where a primary separation, to use the terms of the office, is made. Local mail, for example, is separated from mail which is going to other cities. Letters going to distant states are placed in separate pouches. Our letter, it happens, is to be delivered in the city in which it was posted. It is taken with hundreds of others to the table of the carrier who works in the section of the city where is located the street the name of which appears on the face of our letter. The sorting clerk into whose hands it fell has started it in the right direction. Now it is buried in a great mass of other mail from which it will be sorted to the carrier of the district to which it belongs.

This carrier is standing before a rack with tiers of shelves divided into compartments. Each tier is marked with the name of a street, while each compartment bears a number, these numbers being in 1, 3, 5, 7, 9 order. Here is a little section of the great city itself, with the streets, and the numbers which we should expect to find on the front doors of the houses or shops. As he sorts his letters the carrier goes over his whole route mentally, and when he has finished, each letter stands in the rack in just the order in which it is to be delivered. Then

he removes them from the rack, without disturbing their relative positions, ties them into little packages, stores them in his pouch, and starts out. When he reaches the house to which our letter has been directed, it is our letter which he finds just under his hand. It has been picked up with the others in the miscellaneous collection and methodically given its proper place.

But suppose our letter had been directed to the occupant of an office in one of the great down-town buildings? It would have been handled in precisely the same way except that the carriers' racks would have been divided into corridors or floors instead of streets, and the numbers would have been those of offices instead of houses. In some of the larger buildings as many as six carriers are kept constantly at work eight hours a day delivering mail. That is, there are six distinct routes in a single building, and the carriers work nowhere but in that building year in and year out.

Having traced a local letter to its destination, let us choose on the assorting table one which bears the name of a city hundreds of miles away. We will say that we are in Boston and that this letter is going to Chicago. We find all the letters for Chicago addresses going into special sacks. Presently these sacks are loaded into automobile vans and rushed to the railroad station, where they are thrown into railway mail coaches. A few minutes later the train is bearing them away at the rate of forty miles an hour.

A railroad post office is an exceedingly busy place. The sides are lined with pigeonholes, and mail sacks are supported by metal holders, with their mouths open to receive the stream of letters and papers which comes from the hands of the clerks. These men sort the mail as the train rushes on through the night, working with remarkable energy and precision and quite untroubled by the swaying of the car as it rounds curves and climbs over mountains. In this manner the business of the post-office department is expedited to a wonderful extent and a great amount of congestion in city post offices is avoided.

Our Chicago letter, however, remains for a long time in its sack. The clerks are making up pouches for cities and towns all along the route to Buffalo, and these pouches are being delivered at the various stations. Where the train does not stop, they are thrown off while others containing new mail are deftly snatched by a mechanical arm at the side of the car, as the train shoots past with speed undiminished. (See Volume IV, page 269.) After Buffalo has been reached and passed, the pouches marked Chicago are opened. Presently our missive finds itself tied up with hundreds of others going to the same quarter of the great city. The railway mail clerks have sorted not only for the city but for the section of the city.

HOW ARE SPECIAL DELIVERY LETTERS HANDLED?

Special delivery letters have the right of way in every post office. The moment such a letter is seen it is separated from the other mail and sent forward at the greatest possible speed. As soon as it reaches the office of delivery a special messenger, who may be a boy hired for the purpose and mounted on a bicycle, or a substitute carrier hurries away with it. The letter must be signed for and the messenger must bring back a receipt. The ten cents in addition to the regular postage charged for the handling of a special delivery letter by no means pays for the additional labor and expense involved.

HOW ARE REGISTERED LETTERS PROTECTED?

Extraordinary pains is taken to protect registered mail. A receipt is given for it. It is deposited in a pouch having a rotary lock. Every time the pouch is opened a new number shows on the lock. Also, every time an employee receives the pouch he is obliged to give a receipt for it. By means of these receipts and the numbers on the lock it becomes a simple matter to learn the name of every person who has had occasion to open the pouch on its journey from one town to another.

So far as possible, all registered matter is passed along from hand to hand as an additional protection. When, finally, the carrier takes it for delivery, he gives a receipt for it, and when he hands it to the person to whom it is

THROUGH THE POST OFFICE WITH A PARCEL POST PACKAGE

The smaller illustrations show how a package is mailed, weighed, stamped, and loaded into a wagon. The motor truck in the lower picture was adopted to insure quick delivery.

addressed, he in turn takes a receipt, which will be forwarded to the sender, if the request is made. Is it surprising that the proportion of loss is exceedingly small?

WHAT PLAN IS FOLLOWED WITH PARCEL POST PACKAGES?

Uncle Sam was very slow about giving his people parcel post privileges. Most countries in the Old World had a parcel service long before it was introduced into the United States. Its success, however, was assured almost from the first.

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Both the capacity of the post offices and the resourcefulness of the officials were taxed to meet the new conditions suddenly presented by the parcel post. Much more room has been required, hundreds of extra men have been employed, and wagons and automobiles have been purchased. Weight, size, and distance of journey are the three factors which must be considered in handling this matter. Clerks in this department become so expert that they can tell the weight of a package almost to an ounce when they lift it. Bulky packages cannot be run through a canceling machine. They are marked by means of a stamp made of the same material as the ink rollers on a printing press.

Some kinds of packages are transported in ordinary pouches, while others are given special containers. Eggs are shipped in common egg crates when a full case (containing thirty dozen) is mailed. All sorts of farm produce go through the mails with an average loss estimated as less than one tenth of one per cent. Yet unusual precautions have to be taken. In the larger offices ice boxes have been installed in which to store perishable goods which must be kept over night. Otherwise butter might melt on the way, or berries be reduced to an unsightly mass when delivered.

DOES MUCH MAIL GO ASTRAY?

Thousands of letters mailed each week are never delivered, but usually the reason lies in the fact that they were not properly directed. There are occasional losses through thefts and railroad wrecks, but as a rule the fault lies with the sender. Every week at least ten bundles of mail matter two feet high and containing at least ten thousand individual pieces are sent to the Dead Letter Office from each of forty or fifty large cities. This is mail which it has been impossible to deliver, but it has not been lightly passed over. In the main post office in one of these cities, twelve men give their entire time to the work of interpreting addresses which the clerks and carriers have been unable to decipher. These men are called "directory searchers." They work with the directories of their city and adjoining towns always at their elbows, and what they accomplish

Photos, U.S. Air Mail Service

WITH THE AIR MAIL

The Air Mail Service of the United States covers great distances with phenomenal regularity and speed in the face of all difficulties. (See also Volume Two, page 151.) Above is an air mail plane on skids for winter service, while below a plane is shown connecting with the regular postal delivery service.

seems beyond the powers of man. In such cities as New York and Philadelphia a force several times as large is required for this task.

It is remarkable, considering the vast extent of the postal business, that so few mistakes are made. Consider the fact that simply between Boston and New York there are twenty mail trains each day and that some of them have eight cars, each loaded with letters, papers, and parcels. Multiply this by the number of cities in the United States between which such service is given. Then consider the vast number of small cities, towns, and villages, and last but not least, the rural free delivery service, which has brought the advantages of the post office to the doors of hundreds of citizens who were never well served before, and we begin to get some idea of the great network of intercommunication which Uncle Sam has spread over his country.

With a constantly increasing volume of business, speed takes on an ever increasing importance. The use of automobile trucks has been a step forward. Much time has also been saved by the use of pneumatic tubes, which have now been installed in New York, Chicago, St. Louis, Philadelphia, and Boston and are being set up in other cities. These tubes run underground, connecting the central post office with substations and railroad stations. A box is filled with mail and inserted in the tube. Air pressure is applied by the turn of a lever, and two or three minutes later the loaded box is at its destination.

"Celerity, certainty, and security" — this is the motto of the post-office department of to-day.

WHO FOUNDED OUR AMERICAN POST-OFFICE SYSTEM?

Benjamin Franklin was the father of the United States post office. He first acted for the British government, but was dismissed for political reasons. Then, when the Continental Congress established a postal system in 1775, Franklin was unanimously chosen Postmaster General. It was a very primitive system at first, with rates of postage so high as to make letter writing a luxury, but it was the nucleus of what has become a public utility of enormous proportions. Franklin was an excellent organizer and gave the new service a splendid start.

HOW WAS POSTAGE RECKONED?

For many years rates of postage were reckoned according to distance. One might feel that he could afford to write to a relative in the next township, but not to one in an adjoining state. For half a century from 1792 it cost six cents to send a letter thirty miles. For four hundred and fifty miles and over the charge was twenty-five cents. Up to 1855 letters might be sent prepaid or with directions to collect the postage from the recipient, but since that year prepayment has been required. A few years later the distance handicap was removed and Uncle Sam agreed to carry a letter to any part of the United States for three cents. In 1883 it was found that he was making more profit than seemed necessary and the rate was reduced to two cents.

WHEN WERE STAMPS AND POSTAL CARDS FIRST USED?

Stamps did not come into general use until shortly before the Civil War, and it was not until 1872 that postal cards were authorized; but since that time the business of the service has increased enormously. Think of twenty billion pieces of mail matter being delivered to residents of the United States in one year, of an annual sale of one hundred million dollars' worth of stamps, postal cards, etc., and of money orders to the amount of five hundred million dollars and over. It is a vast enterprise which has grown up under the government's paternal eye since Franklin's day.

WHEN DID THE USE OF ENVELOPES BECOME GENERAL?

In this country not until after the Civil War. In England Sir Rowland Hill secured in 1840 the establishment of the "penny post," and the government issued at that time stamped, adhesive envelopes. The first envelope machine was patented by Edward Hill, March 17, 1845.

WHEN AND WHERE

WHEN WAS ASBESTOS FIRST USED?

THE early Greeks seem to have used it woven into cloth for aprons and in connection with some of their religious ceremonies because it could be made absolutely clean by the great purifier, fire.

Asbestos is a curious paradox because it has the characteristics of both vegetable and mineral matter. It is fibrous like the flax and hemp that grow in the fields; yet it is the one indestructible element on which neither fire, water, acids, nor time have any effect. It is found in the earth in layers between beds of stone. There is no certain means of locating it except by exploring without any definite traces as a guide. It exists all over the world, but the best quality comes from Canada. This is so strong and white that it can be made into stout cloth without the addition of any other substance.

WHERE DO WE GET OUR TIME?

Three and three quarter minutes before noon on every week day the beats of the Naval Observatory clock at Georgetown Heights, in the city of Washington, begin to sound over a special wire of the Western Union Telegraph Company, which is connected with 900,000 miles of telegraph lines stretching all over this country. Once a second a signal is ticked off, until ten seconds before noon. Then there is an interval of silence, and at twelve precisely a final click tells hundreds of thousands of persons that it is noon by the official Observatory clock in Washington. This clock is set and regulated by star time. The Observatory possesses a telescope so mounted that it points always due north or south. Every night several observers watch through this telescope for the passage of certain stars across the field of view. Precisely when these stars cross a hair line in this field each observer presses a key that records the time of transit. Knowing exactly when these stars are due to pass over the meridian line of Washington, the astronomers take the average of these many nightly observations and from it regulate the master clock, so that it is always ready to send the correct signal each noon.

WHERE DID WE GET THE NAMES FOR THE MONTHS OF THE YEAR?

January was named in honor of the Roman god Janus, the two-faced keeper of the doorway of heaven; February for a Roman feast held in that month; March for the Roman god Mars. The origin of April is uncertain. May is named for a mythical character, Maia, supposed to have been a daughter of Atlas; June probably for the goddess Juno, though possibly for the Roman family Junius; July for Julius Cæsar, who was born in that month and named it after himself; August for his nephew, the Emperor Augustus. September, October, November, and December (formed by adding "ber" to the Roman numerals *septem*, *octo*, *novem*, *decem*) mean "seventh," "eighth," "ninth," and "tenth," respectively, because they held those places in the old Roman year, which began with March. Our present calendar was introduced by Pope Gregory XIII in 1582 and adopted in England and America in 1752.

WHEN WAS THE FIRST LETTER WRITTEN IN AMERICA?

In January, 1494, by Dr. Diego Alvarez, who was with Columbus on his second voyage. It was written to the municipal council of Seville, giving the first description of the New World, and left the port of Isabella, San Domingo, February 2, arriving in Seville April 8, 1494.

WHY IS THE LION CALLED THE KING OF BEASTS?

IN the days of ancient Rome, before the tiger was well known, the majestic appearance of the lion and his tremendous strength caused him to be given the title of the "king of beasts." The elephant, the hippopotamus, and some other animals were larger, but none possessed the same combination of dignity and might which the lion displays.

In actual fact the lion is not very courageous but will fight only when cornered. The tiger, equally splendid in appearance, is far more daring, as he will attack any animal, even man, when once he is roused or disturbed.

WHY HAVE THE BUFFALO BECOME ALMOST EXTINCT?

Although the buffalo were killed by the thousand during the middle of the last century, this would hardly explain the disappearance of the vast herds once so common on the Western prairies. Just why they are almost extinct is not settled. All that can be said is that the environment has ceased to be favorable to them and they can no longer live in their former homes.

WHY DO PLANTS TURN TOWARD THE LIGHT?

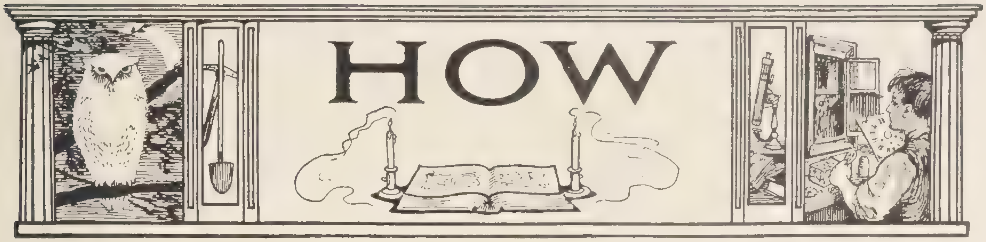
Light retards the growth of certain organs in plants, so that the side of the plant with most light upon it grows more slowly than the side in the shade. This action causes the plant to bend to the light.

WHICH ANIMALS POSSESS THE MOST INTELLIGENCE?

The ant, the elephant, the horse, the cat, and the dog.

WHAT ANIMALS ARE NOT KILLED BY BEING FROZEN?

Butterflies, snakes, some bacteria, and other living creatures do not appear to be injured at all by being frozen stiff. (See Volume III, page 317.)



HOW ARE SHARKS USEFUL?

THE skins of sharks, which are rough as well as tough, are used for polishing finely grained wood and for covering the hilts of swords and the handles of tools. The Chinese use the fins for making a rich soup, and a valuable oil is obtained from the liver.

HOW MUCH DOES AN ELEPHANT WEIGH?

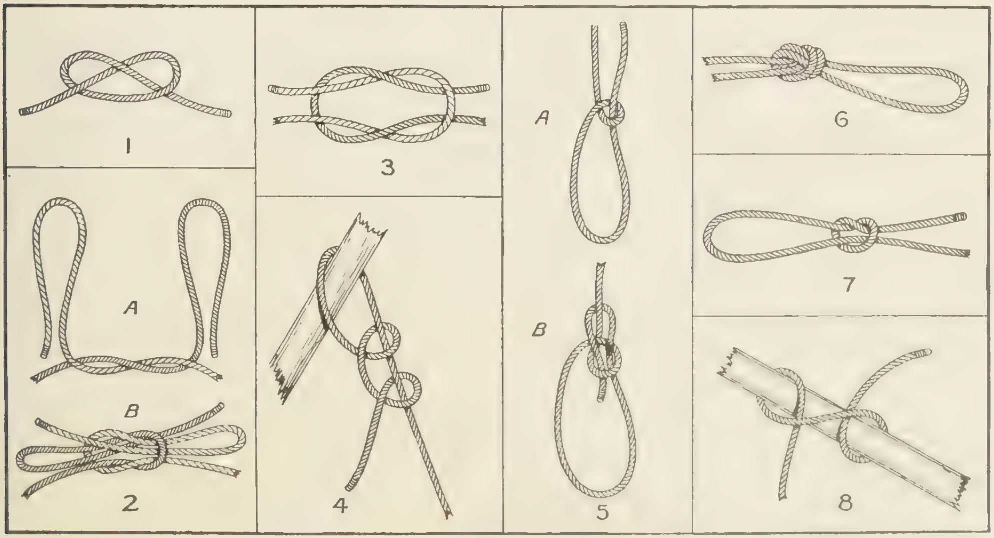
The average elephant weighs five tons or more and is from eight to ten feet high.

HOW CAN A BAR OF IRON BE CUT AS IF IT WERE PAPER?

By turning hydrogen gas on it. Hydrogen gas is a powerful reagent much used in the chemical laboratory for separating metals into groups in inorganic analysis.

HOW DOES THE FLIGHT OF A DIRIGIBLE BALLOON DIFFER FROM THAT OF AN AËROPLANE?

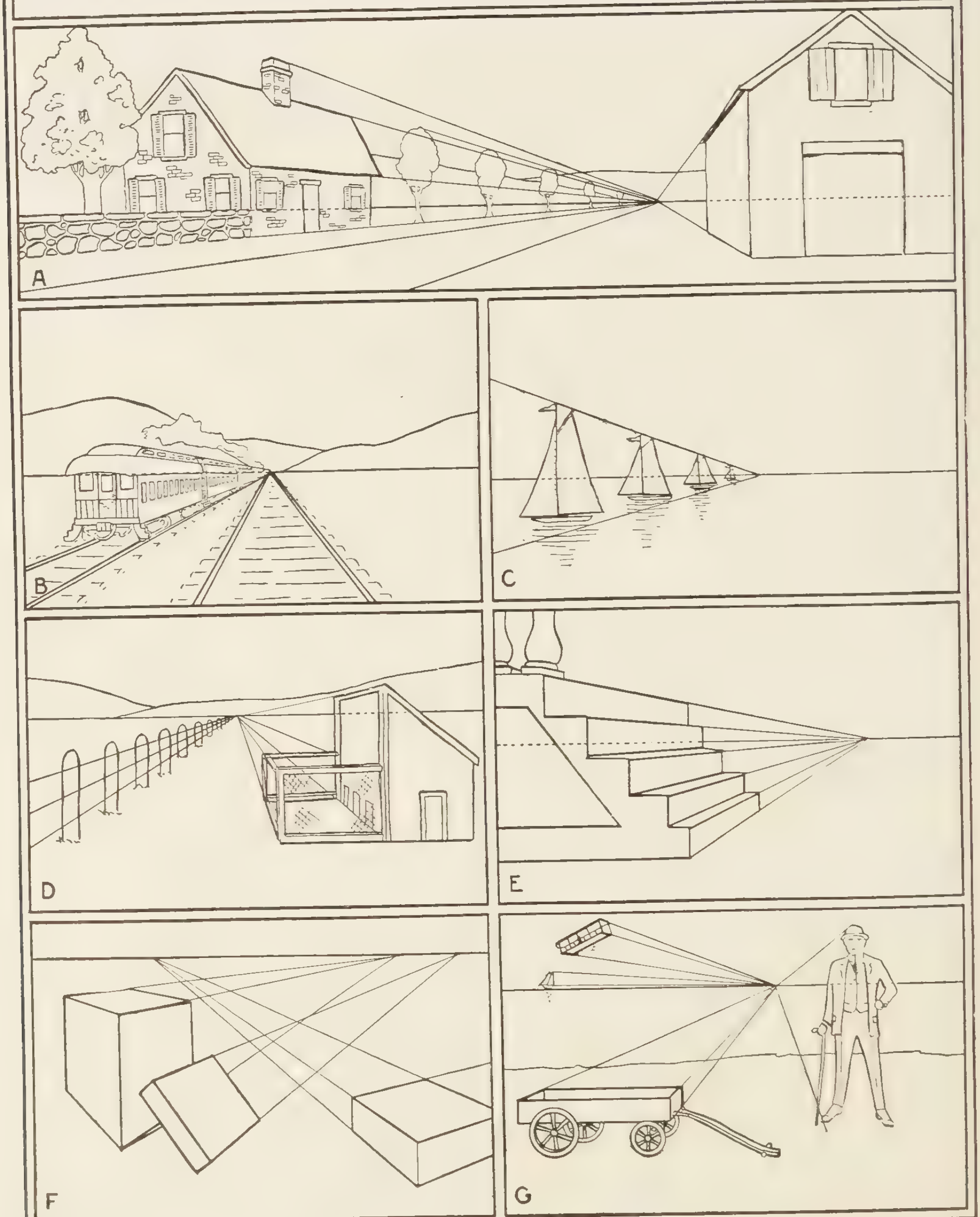
The dirigible balloon rises because it has less weight than the air it displaces. It is capable of remaining stationary in the air or of moving in any direction through the air by means of its propellers and rudders. The aëroplane, on the contrary, is heavier than the air and relies upon the pressure of the air due to its velocity through it to hold it up. It cannot remain stationary in the air, and should its engine stop, would be obliged to descend. In order to stay in the air an aëroplane must run at a high speed.



HOW MANY OF THESE KNOTS CAN YOU MAKE?

1. Overhand knot. 2. Full-reef knot. 3. Square knot. 4. Two half-hitches. 5. Bowline. 6. Loop knot. 7. Slip knot. 8. Clove hitch.

SIMPLE PERSPECTIVE



HOW TO TRAIN THE EYE TO SEE THINGS IN PERSPECTIVE

To learn to see with the eye of the artist is to acquire a new faculty and to get an entirely new look at the world about you. This page shows the more simple arrangements of perspective as applied to different subjects.

HOW CAN YOU TEACH YOURSELF THE FIRST PRINCIPLES OF DRAWING?

NO power gives more pleasure in its use than the ability to handle a brush or pencil with some degree of skill. We cannot all be artists, but by persistent study and practice a certain degree of proficiency may be acquired. Without practice one can gain little or nothing. Not only is knowledge of the theory required, but the eye must be trained to see and the muscles of the hand and arm must acquire freedom and a graceful, firm stroke. The beginner should make his first simple studies at arm's length, using a blackboard or a large sheet of inexpensive paper.

WHAT IS PERSPECTIVE?

Perspective is the art of representing objects as they actually appear to the eye. But why must we talk about the way objects appear to the eye as if it were different from the way they really are? The answer is very simple, because they *do* appear differently. If you want an illustration of that fact, take the familiar example of a railroad track. Of course the rails are parallel, but as you stand in the center of the track, they seem to approach each other until they meet at the horizon line. The reason for this lies in your eye and the way it sees things. Objects become visible to the eye because they reflect light rays. Picture light rays as coming at different angles and striking all together at the point of your eye, making a kind of cone of which your eye is the apex and the distant objects are the flat base, connected by rays of light which make up the sides of the invisible cone. Now your eyes will judge size and distance of objects by their relative positions, or, putting it another way, by the angle between them. Turn this study round and try to find out the relations of these objects so that your picture will make the same impression on the eye that the real objects do, and you will be learning to "see things in perspective."

In making a drawing, the first thing to be decided upon is the horizon line, which will be at a level with the eye of the artist. Every picture must have its horizon line. The point where you stand is called the "ground line," and will be parallel with the horizon line. The distance between these two lines is called the "perspective plane." All parallel lines which extend from the eye of the artist seem to meet at a point on the horizon line, and the point at which they meet is called the "center of vision." Every picture must have its center of vision. Our illustration of "Simple Perspective" gives the center of vision in each sketch, showing in *A* long and short perspectives, in *B* perspective illustrated in receding distances, and in *C* three ships in a line giving relative perspective from their positions as related to each other. *D* gives two sets of converging lines; the stairs in *E* are drawn right since their lines when extended meet in a center of vision; in *F* three objects are placed in different positions, showing their individual perspectives; and in *G* we see the center of vision for four widely differing objects.

WHAT DO WE MEAN BY COMPOSITION?

Every picture must be well composed; that is, its parts must be so combined that a harmonious whole will be produced. To help the amateur to know how to compose his pictures, we have shown in our page, "The A B C of Composition," six finished pictures, with corresponding diagrams of the original schemes of composition. The student will not always compose his picture according to these schemes, but he will find in this set a wide variety. He will also see that he must plan his pictures with this thought always in mind. If the musical composer recorded every tone that came to his ear, his work would be a riot of discord. The artist must select what will please the eye, as the musician selects what will please the ear. Take from Nature the principles of balance and you take away her harmony; take the harmony away and you have chaos. A picture may have in it a horse, a fence, a tree, a road, and a mountain; but these things thrown together on paper or canvas do not make a picture. They must be properly composed. "The artist," says Whistler, "is born to pick

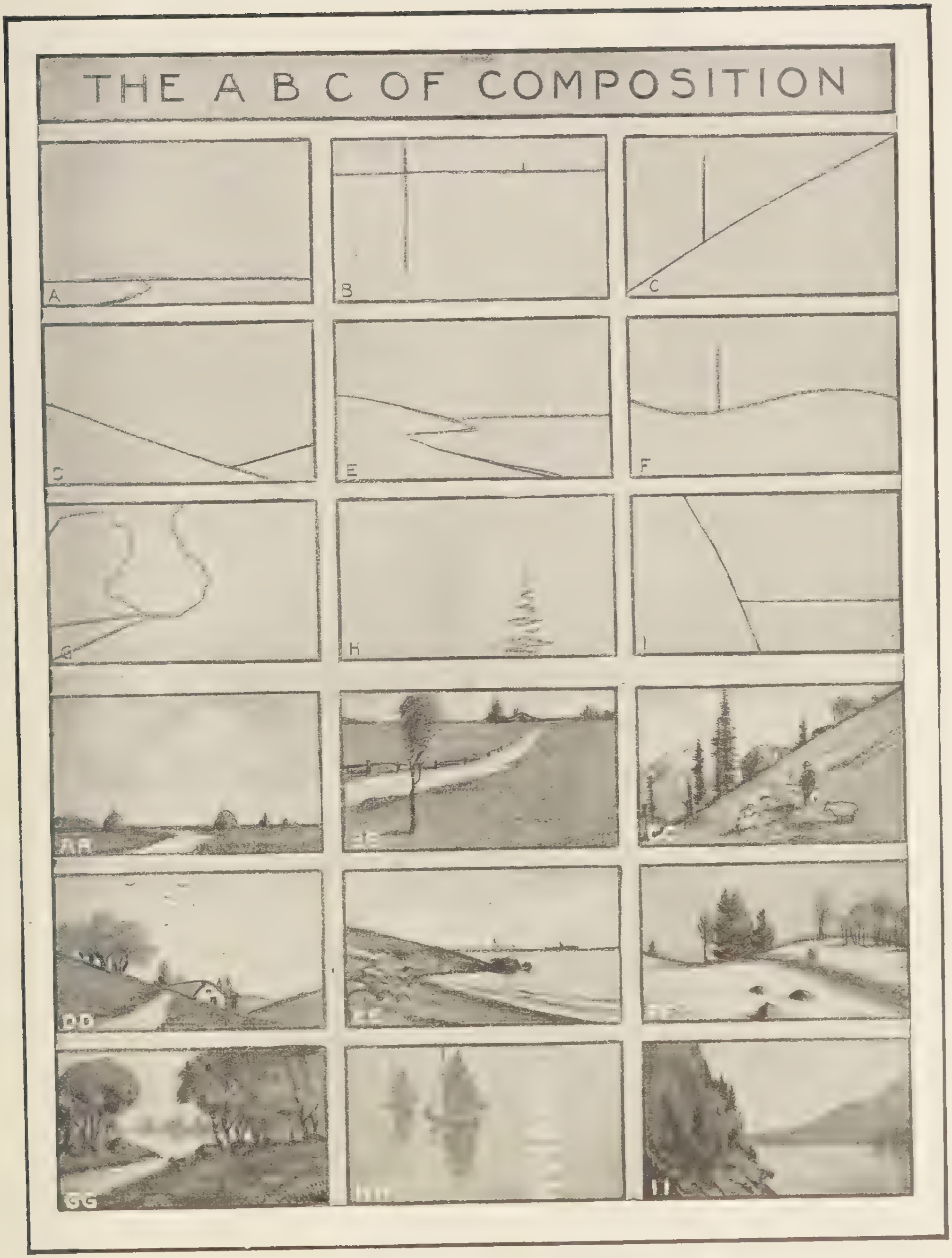
and choose and group with science these elements, that the result may be beautiful." Nor is Nature always right or to be taken just as she is. If she were right, then the camera would be all-sufficient and no brush or pencil would be necessary.

Follow out the composition of each of these views on the opposite page. *A* and *AA* give a picture should not be symmetrical, but should be composed on the principle of a steelyard balance, the light weight on the long arm balancing the heavier on the short. *C* (*CC*) shows the oblique line of a mountainside relieved by tall pines and balanced by distant snow-capped peaks. *D* (*DD*) is a more ordinary composition with slanting lines that draw the eye to the cen-

A MODEL FROM FOUR VIEWPOINTS

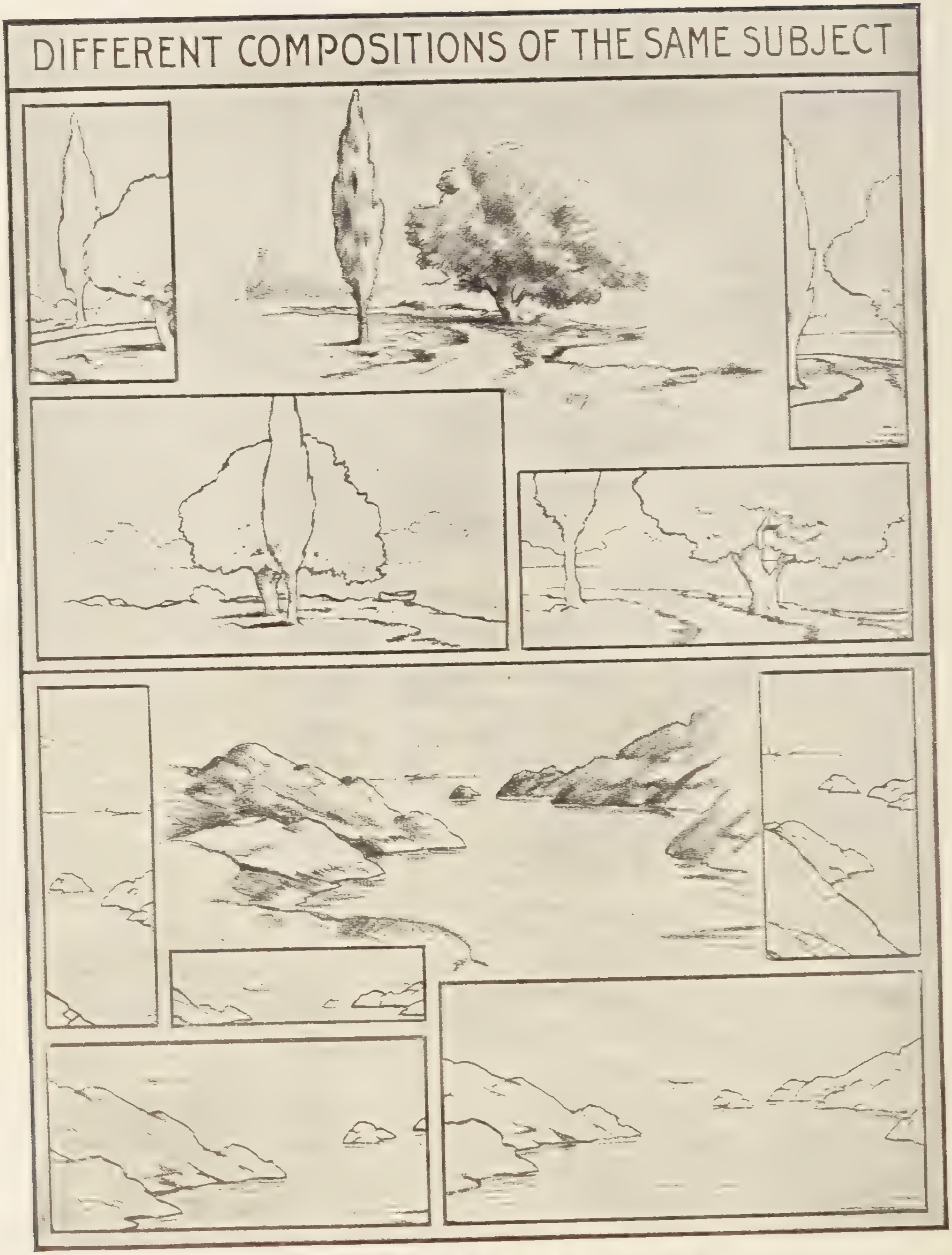
Study the position of each artist and the corresponding view if you could step behind each canvas.

sky picture with a low horizon. The river turns just enough to the left to destroy the symmetrical effect which would come if it came straight out in the center. In *B* and *BB* we have a high horizon picture, offering a good opportunity for long perspectives and for detail in the foreground. The sky is treated very simply, and the long road is intercepted by the tree, which helps the composition. This demonstrates also the principle of balance, the tree, the heavy weight in the foreground, being balanced by the small house on the horizon. A ter of the subject and away from the apple tree, which is of secondary importance. *E* (*EE*) can be varied in many interesting ways. This placing of the shore allows the horizon to intercept the beach at about the right point. The shore with its detail is balanced by the steamer in the distance. *F* (*FF*) has the compound curve, Hogarth's line of beauty. The tall tree, a little to the left of the center, breaks the main line, and the stone wall leads the eye away from the main line of the picture, making the foreground more interesting. *G* (*GG*) gives the



SHOWING NINE VIEWS IN DIAGRAM AND FINISHED SKETCH

For a study of each picture see pages 284 and 287.



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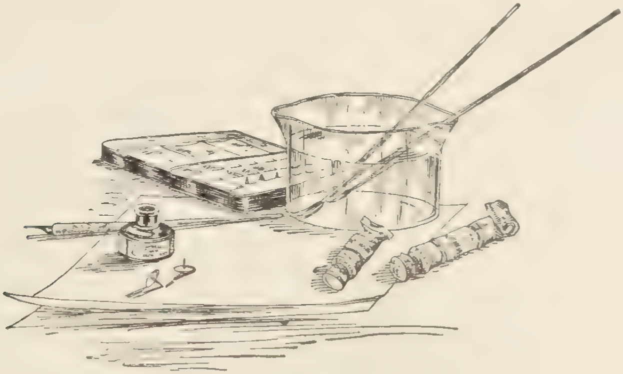
For a further description see the opposite page.

Corot or Constable idea of composition, the main line given by the outline of the trees, while the distant horizon is merely accessory. In *H* (*HH*) the horizon line is left almost entirely to the imagination, being suggested only by the beginning of the reflection. The smaller boat prevents the existence of two principal points of interest. In *I* (*II*) the principle of the steelyard balance is again demonstrated, the steep bank on the left being balanced by the distant mountain and shore.

The student will be interested to try some of these plans for himself. As he rides on a train or turns a corner he will come upon an interesting bit of composition of which he can jot down the main features, leaving the details to be filled in later.

When these simple principles of composition have been mastered, the student is ready to consider one subject from different points of view. In "Different Compositions of the Same Subject," page 286, we have shown two scenes sketched from different viewpoints and arranged in panels to show parts of the scene. In the center at the top is shown a bit of landscape with a road, two trees — one a tall poplar, the other a rounded willow — and a lake. If we stand near the water and look in toward the subject, the willow is brought into the foreground with the poplar tree beyond, as in the panel in the upper left-hand corner. In the right-hand panel only parts of each tree are shown, the sketch making a feature of the path. For the lower left-hand panel of this set we stand far inland, which brings the poplar tree into the foreground with the willow beyond. In the lower right-hand sketch a section of the main scene is presented with the emphasis laid on the artistic tree trunks and the path. The marine view in the lower half of the page can be similarly studied out. In this scene we see again the variety that can be obtained in composition as the artist moves a little to the left or to the right or features a different section of his panorama. In the sketch on page 284 this point is brought out even more clearly, for we are shown not only the different views of the model obtained by each artist but also the position of the artist to get these views.

Do not make it your aim at first to produce a finished picture. Study rather which view you will choose, and how to divide your space into proper proportions, with the objects grouped in pleasing positions. Whatever your success in the finished picture, you will find that you have gained what will serve you almost as a sixth sense in observing the world about you.



HOW AN ARTIST WORKS OUT HIS PICTURE

These sketches from the notebook of the famous children's painter, Ludwig Knaus, show both his first hasty drawing of a pose or a face, and two finished pictures. For other pictures by him, see Volume V, pages 276 and 277.

"AN AWFUL POSSIBILITY"

Study the clever handling of facial expression by McCutcheon, the cartoonist. Take the third child from the left, and see how the expressions of eyes, nose, and mouth are changed by the straightening or curving of a line.

WHAT IS TUNGSTEN?

TUNGSTEN is a metal, discovered in 1781 by a Swedish mariner. Its name is a combination of two Swedish words meaning "heavy stone." Most of the metal comes from Argentina and the United States. It is used principally to harden steel and for electric-lamp filaments. The best tool steel contains from one tenth to one fifth of metallic tungsten, a mixture which does not require tempering and is very hard. Drills and other cutting tools used in machines lose their temper if the machines are run at high speed, so that the use of this new tungsten steel has been of immense value. Were it not for the use of this steel in modern machine tools, automobiles would cost at least two hundred dollars more each.

Tungsten filaments are a great improvement over the old carbon variety, for they give more light, use less current, and last far longer. It is estimated that tungsten has saved the users of electricity $240,000,000 a year.

WHAT IS THE RADIO TELEPHONE?

As in radio telegraphy, use is made of the fact that the free space about us will transmit electrical waves even better than wires will. The wave used in radio telegraphy, when produced by a powerful spark, is entirely unsuited for use in a radio telephone on account of its irregularity, which is due to the sudden breaks in the electric circuit. For radio telephony a continuous high-frequency or carrier wave must be used. This carrier wave is moulded by the vibrations of the voice. The vibrations of the carrier wave take place at the rate of several hundred thousand a second. The vibrations of the human voice take place at the relatively slow rate of from less than one hundred to several thousand a second. The carrier wave can be moulded, or modulated, by sending it through the transmitter of an ordinary telephone. The voice waves cause the diaphragm of the transmitter to vibrate. These vibrations are in turn impressed on a conducting medium which changes its resistance very much in accordance with the voice vibrations. Thus the high-frequency vibrations which are sent out into space vary in magnitude as directed by the voice. In practice, the transmitter is not connected directly in the circuit, as it cannot carry the large currents necessary for transmission over long distances, but the principle is much the same. The form of the electric wave is thus modified. The modulation wave is sent out through the air by the usual aërial of radio telegraphy, where it spreads out in all directions from this center and is picked up by the aërial of a distant station, where it can be translated back into speech again.

WHAT ARE MIRRORS MADE OF?

The making of a mirror is at the present time a far quicker process than it used to be. In the past, mirrors were made by covering the back of a piece of plate glass with an amalgam of mercury and tin foil. The sheet of tin foil was spread on an iron or stone slab where a solution of mercury about a quarter of an inch in depth was poured. Raised edges of glass prevented the mercury from running off the slab. The glass to be coated was then carefully cleaned and slipped on the table so that no air or dust got under it. Heavy weights pressed the glass against the liquid solution and the amalgam at once adhered to the glass. When thoroughly covered, the mirror was put away to dry for several weeks.

Now mirrors are made very differently and can be put upon the market much more speedily. The back of the heavy plate glass is sprayed with a pure, liquid silver. This done, a thickness of dark-colored paint is spread over it and the whole thing is dry and ready to be sold on the following day.

EVERYDAY DEALINGS WITH MONEY

WHY MUST WE HAVE BANKS?

THERE are many sides of business life which could not get along without banks. First of all, a man who is making plenty of money must have somewhere to put it that will be quite safe, so he sends it to his bank. This was the first function of the bank, which thus originated as a sign of mutual confidence. It was a great step forward in civilization when one man was willing to trust another man with the care of his money.

In the next place, suppose this man has bought a factory and finds that he has had to spend more than he expected and now needs money in order to keep the factory running until he has sold some of the goods he is making. Of course he has to borrow money. He goes to his bank and places there some stocks or bonds or other property which will sell for more than the sum he wishes to borrow; the bank then lends him the money, to be returned at a time agreed upon. At the end of that time he has begun getting in money for the goods he has been making in the factory, so he repays the bank and receives the stocks or other property put in their hands when he borrowed the money.

Again, suppose he wishes to send some money to a person in another part of the world. Usually he would send his check, but if the money is to be sent to another country or quite a different locality, the banks there might not cash his check. He can send the money itself by express or get a money order from the express company or the post office, but his bank will transfer the amount for even less expense than any of these.

The bank also does business on its own account; it has certain opportunities to buy government or state or city bonds at a lower cost than most people, because it can buy them in large quantities. Then it can sell these bonds at a higher price and make money in that way. It charges for the money it lends and advances to people, too.

Through these activities the banks act as storehouses, as supply houses, and also as traders, helping to keep money in circulation.

WHAT IS A CHECK?

A written order to a bank to pay money to the person named in the check. The amount is taken from the money in the bank belonging to the person signing the check.

WHAT IS A DRAFT?

A draft is a written order very much like a check. The difference lies mainly in the fact that a draft may be an order to a person instead of to a bank. If John Doe wishes Richard Roe to pay him five hundred dollars which Roe owes him, he can write a draft requesting Roe to pay a certain bank the five hundred dollars. When Roe has done so, the bank sends the money on to Doe.

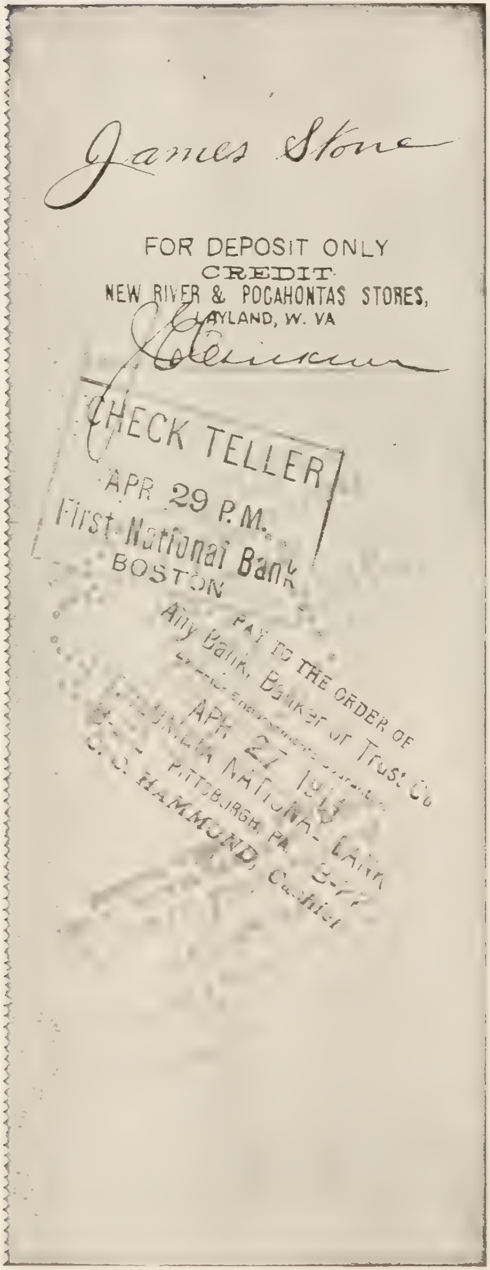
Drafts are also used instead of ordinary checks when money is to be sent abroad or to some remote place where a check might not be easily cashed. In this case the draft is an order from one bank to another to pay the person named in the draft a sum of money.

WHAT IS A CLEARING HOUSE?

If a town has only two banks, each will find, at the end of the day's business, that it holds some checks and drafts upon the other. It is easy enough to balance these against each other and let the bank which still owes pay the necessary sum. But in a city where there are eighty or a hundred banks it would be impossible for them to balance up in quite so simple a manner, yet it would require a tremendous amount of money for each bank to cash all the other banks' checks and drafts upon it.

For this reason the clearing-house system is employed. Clerks from each bank meet at a great central office, bringing with them all the checks received during the day upon the other banks. These are exchanged and the amount due after they are balanced is paid to the bank or drawn from it, as the case may be.

Clearing-house work for all the small towns in a district is done by one bank, called a "correspondent" bank.



A MUCH-TRAVELED CHECK

Showing the indorsement by the person to whom it was made out and the stamps of several banks through which it passed.

WHAT IS A NOTE?

A note is a written promise to pay money. A person borrowing money gives the lender a note as acknowledgment of the loan and assurance of repayment.

WHAT IS SECURITY?

A person borrowing money gives the lender property to hold until he repays him. If he fails to repay, the lender can sell the security and keep the amount which he lent, together with the interest upon it, returning the balance to the borrower.

WHAT IS INTEREST?

Money paid for the use of money. If a business man, for example, needs ready money for the time being in order to carry on his affairs, he will be glad to pay something to anyone who will lend it to him. The amount paid is usually a certain proportion of the sum borrowed.

WHY ARE PAPERS INDORSED?

The signature of a man's name on a document of any sort shows that he accepts some sort of responsibility with respect to the document. Such a signature on the back of a check, a note, a share of stock, or other business paper is called an "indorsement." A check cannot be cashed until the person to whom it is to be paid has indorsed it. If a share of stock is to be transferred to anyone, it must be indorsed. By indorsing a note the person so doing declares that he will pay the note in case the original maker of the note does not. Letters are sometimes indorsed to show that the indorser has read the letter or accepted certain responsibilities connected with it.

WHAT IS A DEED?

A document proving the transfer of property, or else stating the terms of some contract or business arrangement. It is signed and sealed in the presence of witnesses in order to have full legal authority.

WHY IS INSURANCE IMPORTANT?

When ships began to journey all over the world to trade, the owners were often unable to stand the strain of loss and shipwreck. At last someone decided that if proper precautions were taken the ships stood a good chance of getting back home again. They began to reckon what the chances should be, and presently offered to pay the owners a good part of the ship's value if it did not return. But the owner must pay them something for taking this risk.

The owners assented, and in the long run the insurers or underwriters, as they were called, made money, because far more ships returned safely than were lost and all the ships were insured. They had to pay for the lost ship, but the dozens that had not been lost had all paid for their insurance already, and the premiums, as these payments were named, came to more than the amount to be given to the owners of the lost ship.

As the years went on men kept account of the gains and losses until they had figured an average of the number of losses as compared with the number of safe arrivals in port, and from this and other figures most carefully worked out they were able to reckon just how much to charge for insuring any sort of cargo for any sort of voyage.

Besides, they began to collect figures on the length of people's lives, on the risk of buildings catching fire or being blown away by cyclones, or of a man's being robbed or injured in railroad accidents. Nowadays we can insure almost anything against any kind of danger.

Ordinarily insurance seems to be a good business in which to put money for investment, but now and then some terrible disaster will draw heavily upon the insurance companies, and then it takes them some time to make up for the large sums of money they have had to pay out.

One of the best things about insurance is not that it pays you for the loss of your property, but that it helps to prevent your losing it. There is no magic spell about an insurance policy, but the fact remains that when people know that they cannot collect fire insurance when they have neglected to take certain precautions against fire, they take care to attend to these precautions and the fire is not so likely to take place.

WHAT ARE STOCKS AND BONDS?

It often happens that a business is of such a size or nature that one man hardly cares to handle it by himself. In that case he can operate with others as his partners in a simple partnership agreement, or else the business can be run as a corporation. It is in this latter form that stocks and bonds play a part.

The money used in financing a commercial enterprise is called the "capital stock." In a corporation the capital is obtained by selling shares of stock, each of which entitles the possessor to a portion of the interest in the business, to share its profits, and likewise to bear certain additional expenses that may arise. The face value, or "part of each share," is usually one hundred dollars. Each member of the corporation buys some of this stock and has voting power in electing officials of the corporation in proportion to the number of shares he owns. Naturally the men owning the bulk of the stock are the controlling power in managing the business.

The profits are divided among the holders of stock in proportion to the number of shares they own and are therefore called "dividends." Should occasion arise for calling upon stockholders for money, as, for instance, when the corporation is in debt or in need of money, the amount is collected proportionally and is called an "assessment."

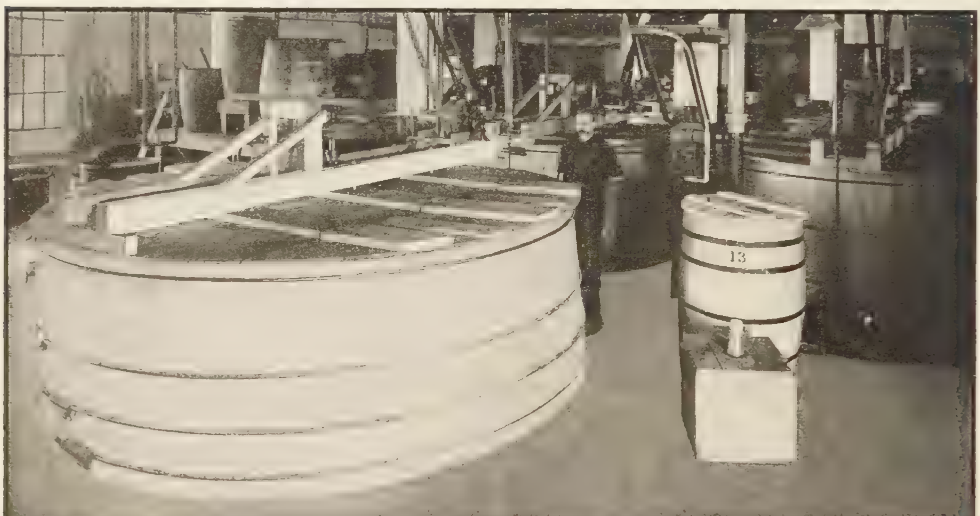
For example, a corporation has $500,000 capital stock in 5000 shares of $100 each. Its net profits are $50,000 for the year. So the stockholders get $10 for each share of stock they hold, as a dividend.

If a corporation desires to raise money it can issue bonds, which are a form of note, paying a definite interest, usually from two to five per cent. Bonds are issued quite commonly by the federal government and by states and cities. Bonds are said to "mature" at the end of a specified time, when the principal, or money lent on the bond, is due to be paid back to the persons who advanced it.

HOW ARE INK AND MUCILAGE MADE?

WE take ink and mucilage or paste for granted as products which can be bought in every city, town, and village; but it has taken Europe, Asia, and India to furnish the ingredients from which they are made, and the services of trained chemists and skilled laborers to get just the right mixtures and prepare the finished product.

One of the principal ingredients of the best inks is tannic acid, which is made from nutgalls which grow in Syria and Asia Minor and are imported from the Mediterranean ports. These nutgalls, which have been used for the making of inks from the earliest times, are excrescences or swellings from the oak tree formed by an insect or fly which bores through the young shoots and lays its eggs in the wound. This irritates the surface and a small tumor develops, which ultimately forms the nutgall, a growth which has cells but no proper vegetable fiber.



Photographs by courtesy of Carter's Inks

IN AN INK FACTORY

At the top of the page is shown the laboratory; below, the huge vats where the ink is mixed.

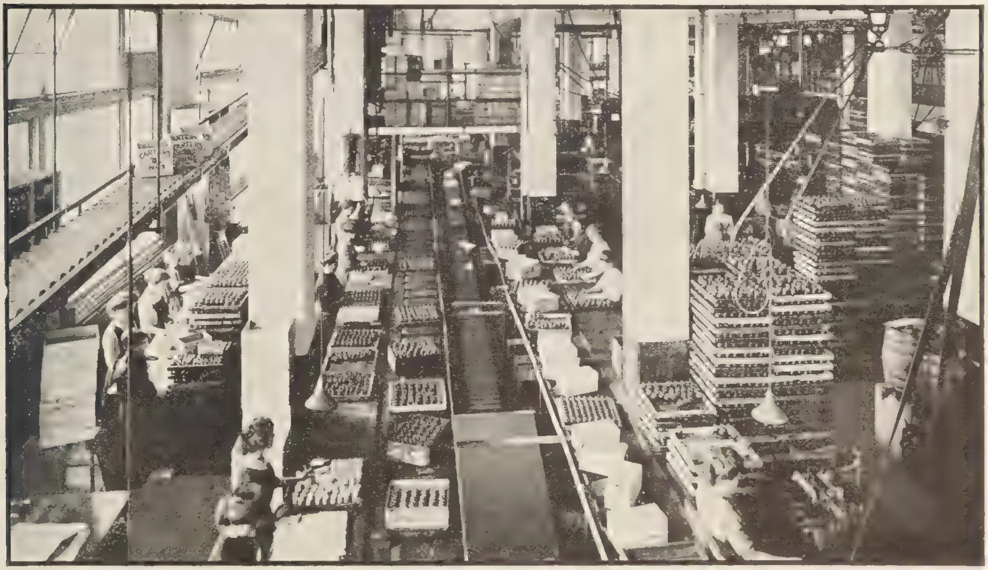
The insect at length becomes a fly and usually escapes by eating its way out. Another important ingredient of writing fluid is an iron salt, ferrous sulphate, which in combination with the tannin has given to inks using these materials the name "iron-gall inks." The iron contributes the permanent and lasting quality to the ink; the tannic acid is the agent which fixes it to the paper.

The amount of ink which one man can make in a day is surprising. The delay comes in the slow bottling. Into a huge vat holding twenty-four hundred gallons, like that in our illustration, the tannic extract is piped. There the ferrous sulphate and a blue coloring matter are added. When the ingredients are thoroughly mixed, the fluid is piped to the storage floor and from there to the great bottling rooms, where, with specially constructed fillers, a large number of bottles are filled at a time. They then go to the corking, labeling, and packing departments; and all this while chemists in the laboratories are working out proportions for new inks and weighing, measuring, and filling prescriptions for the inks that are to be made as carefully as an apothecary fills a prescription.

Often mucilage and paste are being made in another part of the same factory. The gum from which mucilage is made has been known from remotest antiquity. As early as 2000 B. C. it was used by the Egyptians in the manufacture of colors for painting. Three types are used chiefly in the manufacture of gum mucilage — ghatti, which is found in India; arabic, from Egypt; and Senegal from Africa.

The gum is the sap of the tree. It is gathered by men, sorted and picked over by women, packed in bales, and brought to the Nile ports on the backs of camels. At different places along the Nile buyers congregate and make their purchases. Only the purest gums are used in the manufacture of mucilage, the same gum, as it happens, that is used for the making of gumdrops. But while the making of ink is a quick process, the making of mucilage takes a long time; for every little piece as large as the head of a pin must be dissolved, and yet too much water must not be added or the mucilage will not stick.

White paste, which is supplanting mucilage in many cases, is made from a special starchlike material manufactured from potatoes.



THE BOTTLING ROOM TO WHICH INK AND MUCILAGE ARE PIPED

LIFE IN THE ARMY

A company street; a temporary camp; the noonday halt; a section of the machine gun platoon; military mass; a troop of cavalry in column of fours; inspection of a troop in camp; a field battery.

LIFE IN THE ARMY AND THE NAVY

IN Volume VI the two great academies of the United States have been described. Here the story of army and navy is told from the point of view of enlistment and actual service. It is well for us to know a little more of the life of these great bodies of trained men who are serving under our flag.

ENLISTMENT OF SOLDIERS IN THE UNITED STATES ARMY

Boys, in the generally accepted sense of that term, are not enlisted in the United States army; that is to say, the boyish period has been passed and manhood's realm entered before an applicant is accepted by the recruiting office of the War Department as a private soldier. The age of enlistment is between eighteen and thirty-five years, and those who would fight for their country "must be of good character, temperate, able-bodied, and free from disease." Clean-cut, manly men are wanted, and they must be able to speak, read, and write the English language. If they are not natural-born citizens of the United States, they are required to exhibit their "first papers" or the notification "certificate of naturalization" or "copy of declaration of intention" which must be filed with the recruiting officer. The army enlists single men only, excepting that married men may be enlisted upon the approval of a regimental commander or other proper commanding officer under whom they have previously served.

After being accepted by the recruiting officer, the soldier in embryo is sent to the recruiting depot, where he is instructed for two months and then forwarded to his organization. Depots are located at New York City, Columbus, Ohio, Denver, Colo., and San Francisco, Cal.

If a boy weighs more than 165 pounds and is more than five feet ten inches in height, he may not enter the cavalry branch of the army, no matter how fond he may be of horses or how skilled in horsemanship. But his ardor to serve his country need not be cooled, for there yet remains open to him the field artillery, which accepts men between the heights of five feet four inches, the minimum height for any branch of the army, and six feet. Should he not care for the field artillery, he may be assigned to the infantry, the coast artillery, or the engineers, and he may grow as tall as Nature will permit him, providing his weight does not exceed 190 pounds, the maximum weight at which an applicant is enlisted. The minimum weight for all branches of the service is 128 pounds, with occasional variations in favor of those who are otherwise suitable but who weigh not less than 120 pounds.

The term of enlistment is seven years, the first four years to be in the service with the organizations and the last three years to be on furlough without pay or allowances and attached to the army reserve.

With the requirements met and the routine for enlistment gone through, the young soldier goes to the camp of instruction, where his army life begins. The story from this point on is told by Lieutenant Colonel J. A. Watrous, United States Army, Retired.

WHAT DOES IT MEAN TO BECOME A SOLDIER?

THE applicant for enlistment in the army comes up to all the requirements mentioned, and if accepted and enlisted may regard himself as a high-grade specimen of a man. It is no easy matter to become a recruit in Uncle Sam's army.

IN THE CAMP OF INSTRUCTION

Not long after enlistment, or when a number of men are ready, they are conducted to a camp of instruction, which is, as its name implies, a place where the training of the soldier begins and is carried on for at least forty days for even the aptest recruits, and longer for those less efficient. Here the men cease to wear citizens' clothes and are uniformed—a change which is so impressed upon the mind that the soldier never forgets it. There are many things he will not forget, but the two uppermost are the time when he was sworn into the service and the day when he ceased to be clad as a citizen and donned the clothes of a soldier.

To the young recruit the forty days of instruction mean that he is carefully "set up," something that should happen to every boy and man, whether he becomes a soldier or not, but something that is neglected in the cases of a vast majority of men. "Setting up" means being taught to stand, to hold the head — and tongue, too — to throw back the shoulders and throw out the breast, to step, to walk, to hold the hands, and much else. It is no small task to acquire these bits of knowledge. Then there are the various drills, not all of them taught in the camp of instruction, but quite enough of them. They include the one-man drill, the squad drill, a drill in saluting, and roll call. The recruit must learn the calls of the bugle: when to go to bed, when to get up, when to go to meals and how. He must learn how to look after his belongings, including his clothing, bed, etc.; how always to make a soldierly appearance; how to meet with and part from officers; how to obey all superiors; how to govern himself, and especially his temper.

MY OWN EXPERIENCE

I shall never forget my second night in camp, in June, 1861. That day I had obeyed, but with bad grace and anger, what seemed an unnecessary order by a corporal younger than myself. After retiring I took an account of myself. My reasoning was after this manner: "Young man, you are not your own man now, and will not be for three years. You belong to Uncle Sam. You are to do what he, through his officers, demands of you. From this day on you serve your Uncle Sam to the best of your ability, at all times, under all circumstances. Obey all orders promptly, as well as you know how, without growling or looking as if you wanted to growl. Be a real soldier." I felt like a new man the next morning. That night's self-scolding was just what I needed. It made my soldiership easy; I had no more trouble. It opened the way to two noncommission warrants and two commissions; made me adjutant of my regiment and adjutant general of my brigade, and sent me home at the end of the war with the bars of a captain. And it laid the foundation for commissions in the regular army.

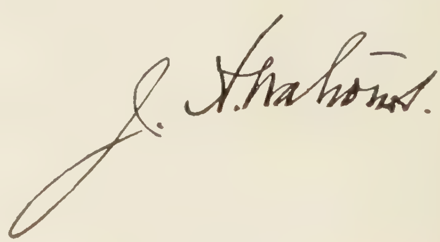
IN THE COMPANY

At the end of forty days the recruits are sent to regiments and assigned to companies. Here there is more drilling, more setting up, more rigid but needed discipline all along the line of soldier experience, more getting ready for any and all emergencies that may arise. From the first the recruit is impressed with the importance of absolute obedience. Here in the company, his immediate soldier family, he gets more instruction in the matter of guard and picket duty. Here he learns company drill, the use of arms, and in time takes part in battalion and regimental drills. He learns how to appear and what to do on dress parade; how to do his best on practice marches; and much else that is essential to good soldiership. Here he gets new ideas of the importance of keeping not only his person, but his uniform, his shoes, his arms, and his quarters clean.

THE SOLDIER'S RECREATION

For all real soldiers there is an abundance of recreation. There is baseball, or football, or basketball; there are reading rooms, libraries, and amusement halls in which there are plays, concerts, and dances. Each regiment has a chaplain and there are religious services. Ever since 1898 there have been opportunities to see much of the world — to cross the continent, go to Honolulu, see Japan and China, and serve in the Philippines — in themselves much in the way of an education.

I am not called upon in this connection to tell what I think of service in the army, but to tell something of what it means to enlist. That I have tried to do. This much I am free to say: It would be a fine thing if there were for all young men an opportunity to get the "setting up" and discipline a man gets in a term in the army.



LIFE IN THE ARMY

Road making; setting up camp; an infantry camp; before the mess shelters were erected; the dental office; the field hospital; mixing tent of the field bakery; a surveying detachment.

WORK AND PLAY IN THE NAVY

These pictures and those on the succeeding pages are snapshots taken by one of the men during a long cruise.

WHAT IT MEANS TO ENLIST IN THE UNITED STATES NAVY

WHEN a boy receives one of the circulars sent to him through the publicity bureau of the navy department at Washington, he begins to wonder what life aboard a man-of-war is like. Then he writes a letter of inquiry to the nearest recruiting office and gets the booklets and circulars descriptive of the requirements for entrance and the duties and pleasures that he may legitimately expect to fall to his lot when he enlists.

If he is of a roving disposition and takes up the navy simply for the fun of it, he is likely to find there is work to be done and he must do his share or he will not be promoted; and his dream of sailing the seas in a loose-fitting blue uniform will be shattered when he finds that, because of his having no definite aim or desire to perfect himself along a particular line, he is made to do the work that others more ambitious than he are not compelled to do.

In the first place after he has read the circulars sent him he will know that his life for the next four years will be one of service to his country and at the same time he will have a regular salary, with his home provided on the sea, and during his term of enlistment he will have an opportunity to perfect himself in some one line which will assure him a respectable living if pursued later in civil life, provided he does not care to reënlist.

THE REQUIREMENTS

If he is between seventeen and eighteen years of age his term of enlistment will be for the period of his minority, instead of for the full four years, and he must present to the recruiting officer who enlists him the written consent of the parent who is the legal guardian; or if both parents are dead he must have the written consent of a legally appointed guardian. When a youth satisfies the officer in charge of the recruiting station that he is a proper candidate, he is sent to the physician of the recruiting station and undergoes a rigid physical examination.

If he is a minor of seventeen years, his minimum height, barefooted, must be sixty-two inches and his minimum weight 110 pounds.

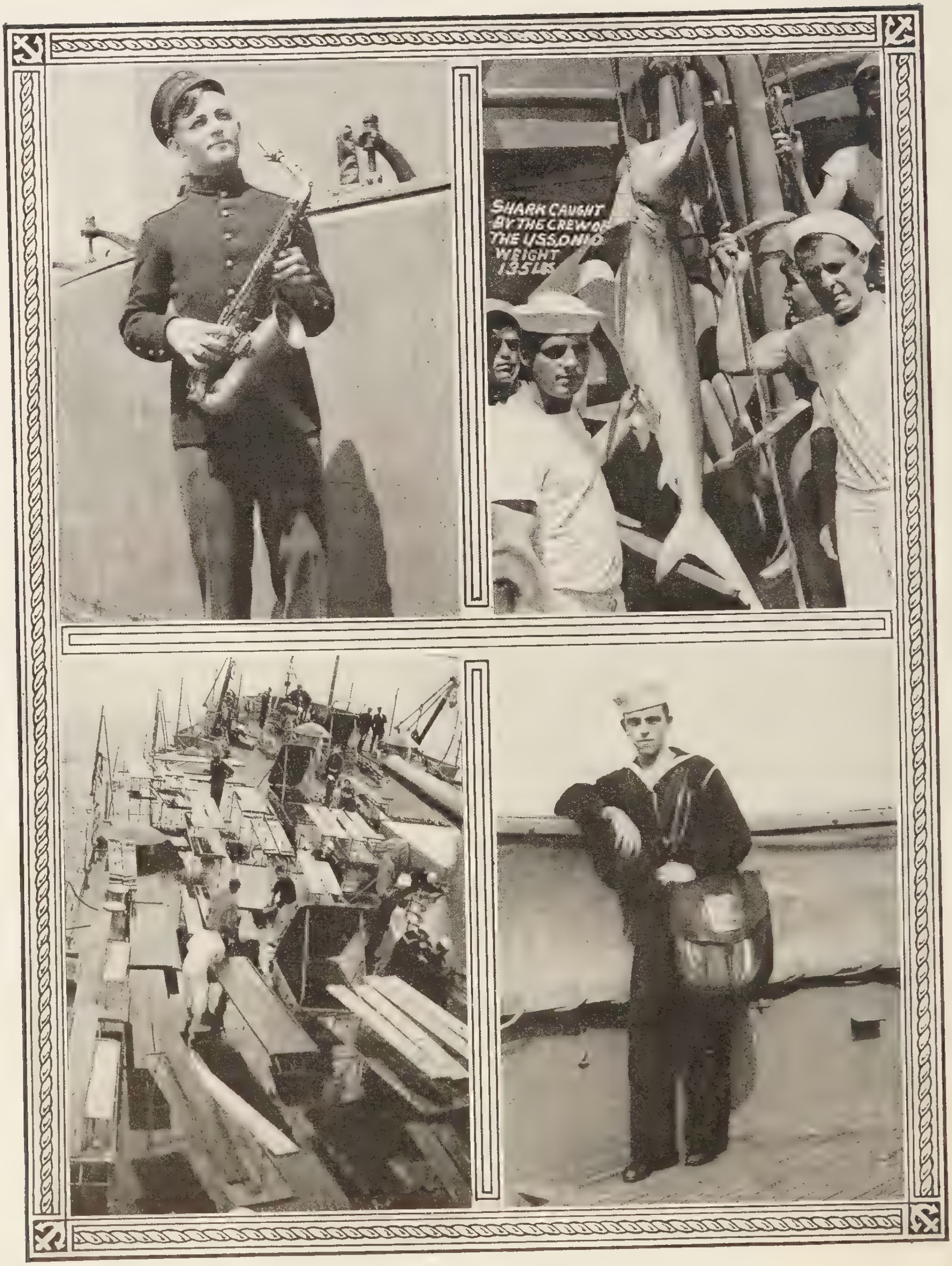
At eighteen to twenty years of age his height must be sixty-four inches and his weight from 115 to 125 pounds. In general his physical condition must be perfect in every detail and he must have at least twenty sound teeth, of these not less than four opposed incisors and four opposed molars. When the doctor passes him, he takes the oath of allegiance, and in the presence of the recruiting officer he is required to declare under oath that he makes a true statement as to the date and place of his birth and his previous services, if any, and that he has no disease either concealed or likely to be inherited.

All applicants for enrollment in the United States navy must be American citizens, native or naturalized, and must be able to read and write English.

THE TRAINING OF A RECRUIT

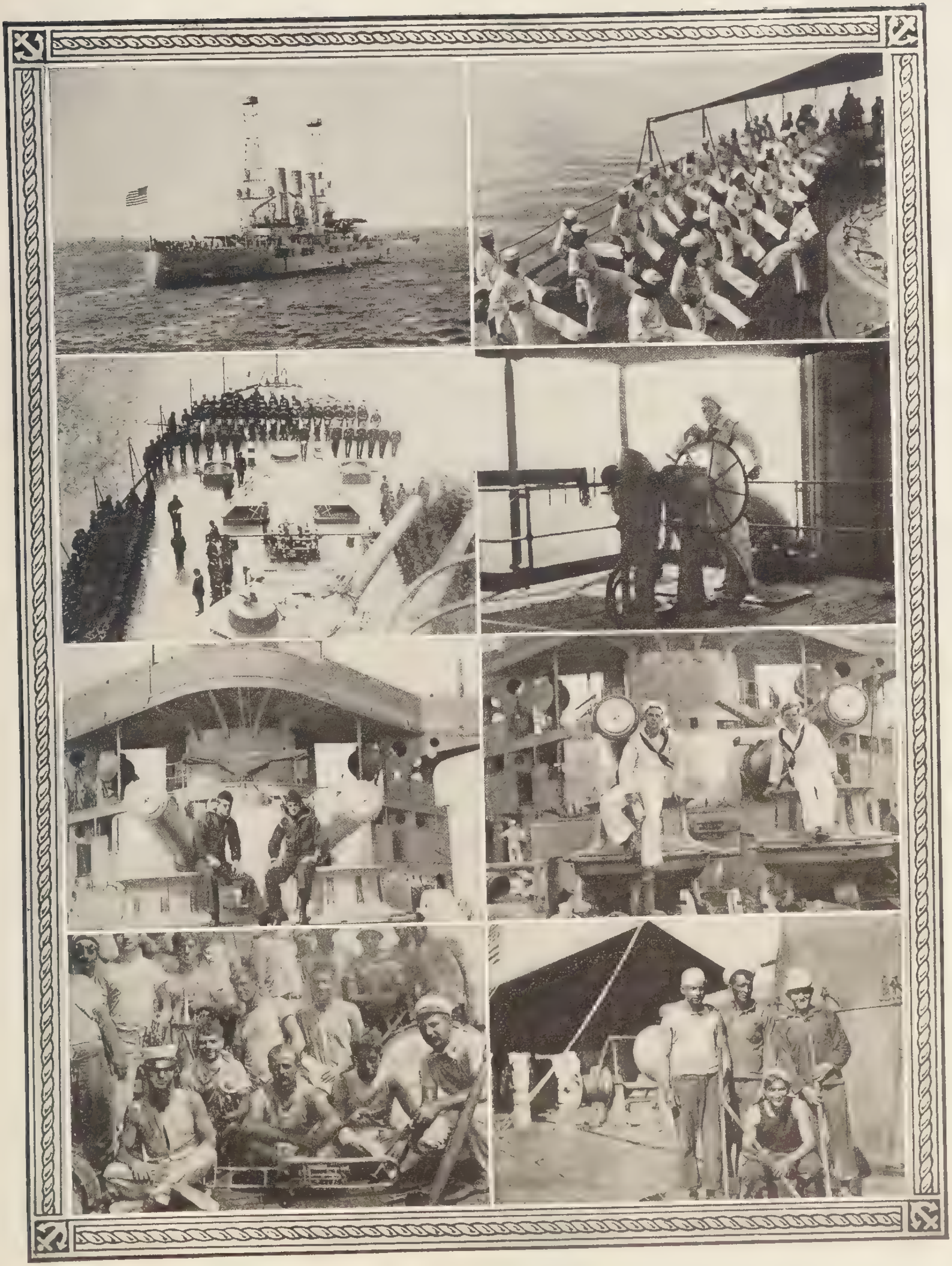
When a youth has fulfilled the requirements of the recruiting office and has been passed, he is sent to the nearest receiving ship. After some days he goes with other recruits to the naval training station, where he is furnished with his first navy uniform, of the value of sixty dollars. Here at the training station he is in his primary—or shall we say kindergarten?—class. He is assigned to a squad and taught the names of the various pieces of ammunition and is given training in machinery and other routine duties of a sailor's life. His term at the training station, where he is an apprentice seaman, is about four months, and he is then sent to a ship, where he becomes a part of the ship's company.

These training schools educate recruits to fill positions in the navy and prepare them for larger usefulness when their term of enlistment expires. There are classes in electricity, where, after serving an apprenticeship in the making of dynamos and engines in machine shops, the sailor pupils put their knowledge to practical test in wiring the ships and in wireless telegraphy, or "radio communication," as it is termed in the navy. In the artificers' schools they are taught the construction of vessels, carpenter work, and the methods of



LIFE ON A BATTLESHIP

A member of the band; fisherman's luck at sea; on the forward deck; the mail carrier on his rounds.



LIFE ON A BATTLESHIP

Off for a cruise; setting up drills; at the wheel; by the big guns; the band in undress uniform; the deck cleaning squad.

construction of the different parts of a ship, their work being in steel, iron, copper, brass, and wood.

After a bluejacket has served his first term of enlistment he is eligible to further courses of instruction in the seaman-gunner classes at the navy yard, Washington, D. C., and at Newport, R. I., the course being intended to fit him for promotion to chief petty officer and later to warrant officer. The school for machinists' mates at Charleston gives opportunity to the engine-room force to qualify for promotion. The stations at Newport and San Francisco have well-equipped schools for yeomen, the scribes or clerical force of the enlisted men of the navy. This course offers an opportunity for stenographers and typewriters to be assigned to the correspondence class, and for bookkeepers and accountants in the accounting class.

Music is a prominent feature of life in the navy, and recruits who can play any of the instruments used in a band have a splendid opportunity to develop their talent and to make themselves proficient in sight reading and ensemble playing.

In the hospital corps there is always demand for recruits who have skill and liking for the duties of ministering to the sick. The youth who takes up this branch of work has large practical experience in the naval hospitals, where the work assigned to him is supplemented by lectures on materia medica, anatomy, and physiology, and by demonstrations in pharmacy and chemistry.

Thus it will be seen that enlisting in the United States navy means selecting a school for training a boy for future usefulness; but all who enter the enlisted service are not ambitious, and such as are not find the government a taskmaster rather than a schoolmaster who pays his pupils for the lessons he gives them.

Opportunity for education and for seeing the world is given the boy who goes to sea in the service of Uncle Sam, and there are many diversions as well as much hard work. If the boy is made of good stuff, he will accept the rigid discipline cheerfully and respond to the bugle that is so omnipresent in the life of a man who goes to sea.

There are certain restraints and privations that go with the life, such as being away from home and sleeping in a hammock from which he must roll at 5.30 of mornings. The régime is not hard, but it requires a deal of self-control, and sometimes a "stiff upper lip" to meet all the requirements; but, to accomplish anything worth while in the way of acquiring a trade or getting an education, a boy would have to sacrifice more on land than if he should enlist in the navy, where his pay is sure, promotion steady, and his occupation interesting.

A SAILOR'S PLAYTIME

What does a sailor do in his playtime? Why, he relaxes from what he has been doing and takes his fun in a clean-cut, legitimate way. The navy is no longer a reform school for boys who cannot behave or learn. Indeed, it was never so; but naturally, notwithstanding the rigid examination required for enlistment, sometimes an "undesirable" gets into the service. He is, however, the exceptional sailor and not the typical one. When shore liberty is granted to a number of the ship's men at a time, there may be a few who do not remain as "clean and sober" as they were when they signed up to leave the ship; but if they return otherwise, it goes against their names and record and they are not anxious to repeat the offense. Obnoxious sailors are soon discharged. The United States may well take pride in the character of its seamen.

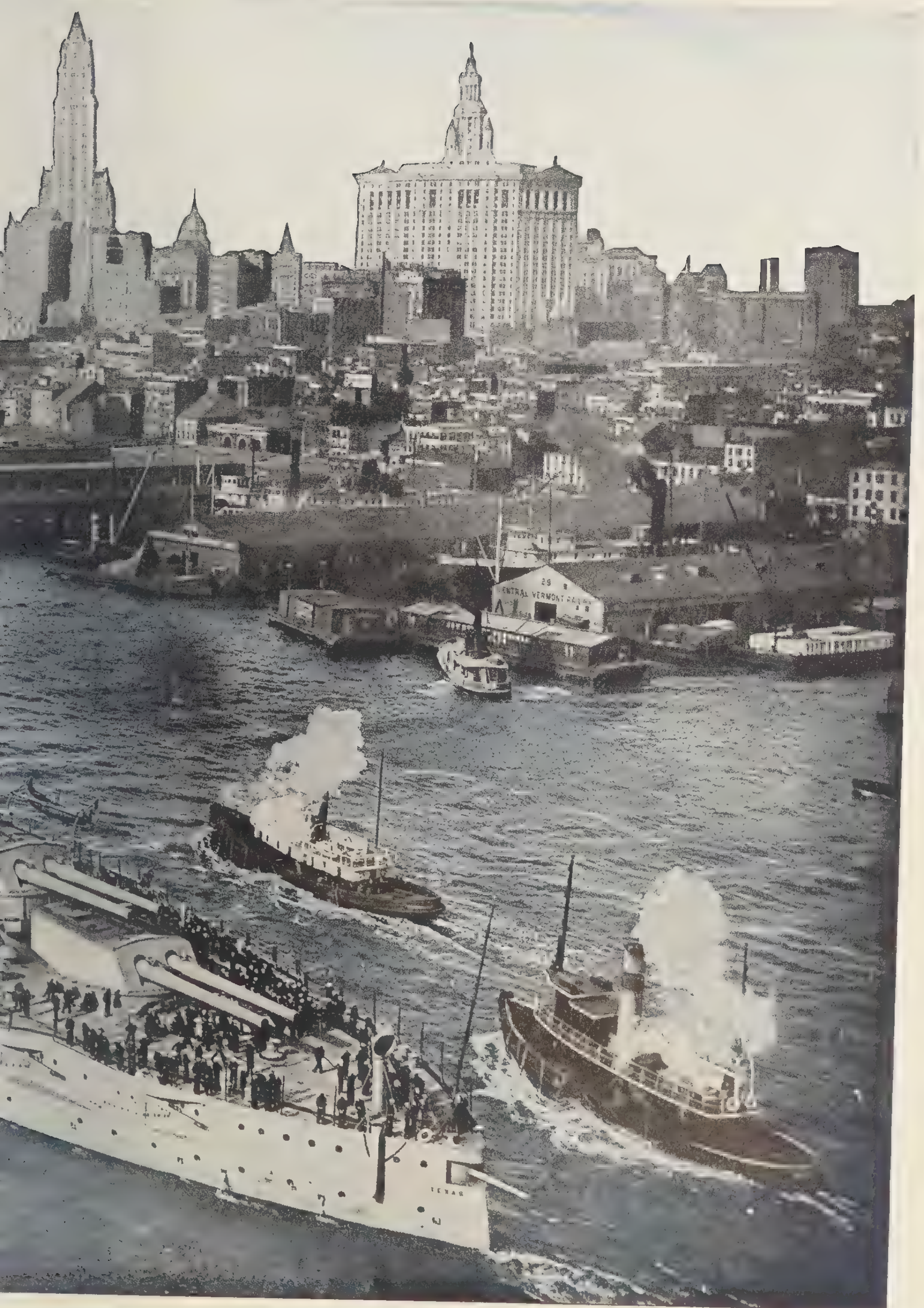
On shipboard there is always music as a diversion; pianos, graphophones, and other musical instruments form a part of the furnishings of the seamen's quarters.

Boys in the enlisted service are like boys everywhere else — they play games. Every battleship and cruiser has its football and baseball teams, and the greatest rivalry is aroused when an intership game or a game with those outside the navy is scheduled.

If a boy considers going to sea, he cannot do better than to become one of the nearly fifty thousand men who are enlisted in the United States navy, for the fact that about a fourth of the number are petty officers shows that they are well treated and that they reënlist when the term of their first enlistment expires.

THE RETURN TO

This skyline of New York has been the first sight to greet hundreds of thous



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WATERS

merican soldiers and sailors, returning victorious from overseas.

THE COAST GUARD

DURING the Great War it was said that if an officer wished to select men for any particularly dangerous service, he was obliged to choose them by lot because so many more would volunteer than were at the moment needed. In times of peace it is equally true that there is never a lack of men for the hazardous callings in which service to humanity may be rendered. The ranks of the United States Coast Guard never lack men who find satisfaction in a calling which is liable at any moment to involve them in extreme danger.

In a country which stretches from ocean to ocean, with many inland lakes and rivers, there is constant need for this service. Our Federal Life-Saving Department is responsible for the rescue of many wrecked crews and the saving of a great number of stranded vessels. The sea and lake coasts of the United States, exclusive of the coasts of Alaska, have an extent of more than 10,000 miles. There are to-day upon these coasts 284 life-saving stations, 195 of which are on the shores of the Atlantic, eight on the shores of the Gulf of Mexico, nineteen on the shores of the Pacific, and sixty-two on the shores of the Great Lakes. There is, besides, a station at the Falls of the Ohio River at Louisville, Ky. These stations are located at selected points of danger to shipping, and vary somewhat in character according to their environment and the nature of the service demanded of them. On some portions of the coast they are placed only at long intervals, while upon others they form chains of contiguous posts within communicating distance of each other. Along the shore of Cape Cod, dotted with treacherous sandy shoals, there are ten stations nearly equidistant which coöperate with each other. Long Island, too, where there is a vast amount of travel, is well protected by frequent stations.

The southern coast of New Jersey, with its long bars of sand, has always been one of the most dangerous portions of our coast and is therefore provided with forty life-saving posts. Between Cape Henry and Cape Hatteras many severe storms are encountered, and here there are frequent stations. Florida and the Gulf of Mexico have shallow coasts and see fewer gales, and in consequence need less protection; the Pacific coast also is not a dangerous one. The Great Lakes, however, are visited

A PRACTICE DRILL ON SHORE

The crew is learning to man the weather whip and haul a passenger ashore on a cable

at certain seasons by violent gales which render the landing of steamers and ships most difficult; in consequence most of the stations there are near harbors. The dam across the Ohio River at Louisville is such a source of danger to boats attempting to cross the river to the city of Jeffersonville that a floating station has been established there.

The stations upon the ocean beaches are generally situated among low sandhills common to such localities, sufficiently back of the high-water mark to be safe from the reach of storm tides. In the majority of stations the first floor is divided into four rooms: a boat-room, mess-room (also serving for a sitting-room for the men), a keeper's room, and a store-room. Wide doors and a sloping platform, extending from the sills to the ground, permit the running out of the heavier equipments from the building. The second story contains two rooms — one a sleeping room for the men, the other with spare cots for rescued people. Every station is surmounted by a lookout, or observatory, in which a day watch is kept. The roofs upon stations which may be seen from the sea are usually painted dark red, making them distinguishable a long way offshore. They are also marked by a flagstaff sixty feet high, used in signaling passing vessels by the International Code.

LIFE-SAVING CREWS AND WHAT THEY DO

The number of men composing the crew of a station is determined by the number of oars required to pull the largest boat belonging to it. There are some five-oared boats in the Atlantic stations, but at all of them there is at least one of six oars. Six men, therefore, make up the regular crews of these stations, but a seventh man is added December 1, so that during the most rigorous portion of the season a man may be left ashore to assist in the launching and the beaching of the boat, and to see that the station is properly prepared for the rescued persons brought from a wreck; also to aid in doing extra work that severe weather necessitates. Where the self-righting and self-bailing boat which pulls eight oars is used, mostly at the Lake stations, a corresponding number of men is employed. The crews are selected by the keepers from able-bodied and experienced surfmen residing in the vicinity of the respective stations. The privilege of choosing his own men is granted the keeper because it is realized that he will feel more responsible for men he himself selects, and that the men will work better under his direction. Upon original entry into the service a surfman must not be over forty-five years of age, and sound in body, being subjected to a rigid physical examination by a surgeon of the Marine-Hospital Service. He is afterward examined as to his expertness in the management of boats by the inspector of the district. His duties are then read to him and he signs an agreement to fulfill them. When a surfman has once signed these articles he can be discharged from the service only by an order from the General Superintendent.

Each man on a life-saving crew has certain definite duties, just as have the men on a foot-ball team. They are organized by the keeper and numbered in their supposed order of merit, the most competent being No. 1. In case the keeper is absent it is this man who takes his place. The rank of his men being fixed, the keeper assigns to each his quarters and prepares a schedule for the day watch, night patrol, boat and apparatus drill, care of the premises, etc. For the purposes of watch and patrol the district officers establish patrol limits, as far as practicable, along the coast in both directions from the stations, marking them by distinct monuments; and a description of the beats thus laid out is sent to the office of the General Superintendent. The day watch is kept from sunrise to sunset by a surfman daily assigned to this duty, who is usually stationed in the lookout and who, if the patrol limits cannot be seen from there, goes at least three times a day far enough along the shore to bring them into view. During thick and stormy weather a patrol like that at night is maintained.

THE NIGHT PATROL

For the night patrol the night is divided into four watches — one from sunset to eight o'clock; one from 8 to 12; one from 12 to 4; and one from 4 to sunrise. Two surfmen are designated for each watch. When the hour for their patrol arrives they set out in opposite directions along

TOP: READY FOR DRILL — BEACH APPARATUS CART, ABSECON STATION, N. J. CENTER: CREW TAKING OUT POWER SURFBOAT, AND POWER SURFBOAT, CAPE MAY STATION. BOTTOM: MAN RETURNING FROM DRILL POLE IN BREECHES BUOY, BEACH APPARATUS DRILL, AVALON STATION, N. J., AND CREW RETURNING FROM SURFBOAT DRILL, ATLANTIC CITY STATION

the coast, keeping as near shore as possible, and go to the ends of their respective beats. If within communicating distance from an adjacent station, each patrolman proceeds until he meets another from the next station and gives him a metallic check marked with his station and crew number, receiving in exchange a similar one. The checks thus collected are examined by the keeper, recorded in the journal, and returned to the proper station the next night. If a patrolman fails to meet his fellow from the next station after waiting a reasonable time at the usual place of meeting, he continues his journey until he either does meet him, or until he reaches that station and finds out the cause of his failure; on his return, he reports this to his keeper, who makes a record of it. At isolated stations each patrolman is required to carry a clock within which is fixed a dial that can be marked only by means of a key which also registers the time of marking. This key is secured to a post at the end of his beat and the patrol is required to reach it and bring back the dial properly marked.

Each patrolman is equipped with a beach lantern and several red Coston hand lights. Upon the discovery of a wreck, a vessel in distress, or one running dangerously near shore, he ignites by percussion his hand light, which gives out a brilliant red flame. This serves the double purpose of warning the people on the vessel of their danger and of assuring them that help is at hand.

EVERYDAY LIFE AT THE STATION

For every week-day a regular routine of duties is appointed. For Monday it is drill and practice with the beach apparatus used for rescue work, and overhauling and examining the boats and all apparatus and gear to see that it is in perfect condition. This equipment consists of a beach-cart, in which is a sand-anchor, a gun, shot-box, pennant, pickax and shovel, haversack of cartridges, breeches buoy, and speaking trumpet. When the drill is conducted an imaginary rescue is enacted, each man playing the part his number entitles him to play. The drill finished, the contents of the cart must be put back in accordance with directions prescribed by the government. This is so the men may always be able to put their hand quickly on the thing needed. On Tuesday practice takes place in launching and landing the boats in the surf. Wednesday comes practice with flags in the International Code of signals to train the men to answer passing vessels. For Thursday there is more practice with the beach-cart. Friday is taken up with training for restoring the apparently drowned, formulated into four rules which each member of the crew must recite. Then an application of the rules is acted out on some one of the number. The men are also examined as to the contents of the medicine chest and what to do with the remedies, and are instructed as to what to do with persons who are frozen. Saturday is taken up with cleaning the station. Each station conforms to this same programme, and if there is any variation in it the reason must be reported.

Since some coasts are more dangerous than others it is unavoidable that certain stations see more active service, and not infrequently there is grumbling among ambitious men who are placed where they seldom have anything more arduous to do than to rescue a bather who goes out beyond his depth, or drag a summer boarder out of the surf. Other men, such as those stationed at Monomoy Point, on Cape Cod, must be ever alert for the most dangerous sort of work. All these men, whether at busy or quiet stations, are paid alike, for the government recognizes that all take equal risks on entering the service and it is not their fault if by pure chance they are placed where the work is light.

In summer the life-savers have little to do beyond the regular routine. If there is a light in the station it must, of course, be lighted at sunset. The man on duty in the lookout must also be prepared to respond by International Code to the Revenue Cutter should she pass, as she frequently does, on a tour of inspection.

The bravery and daring of our life-saving crews and the risks they constantly run to protect human life entitle them to our deepest gratitude and respect. Many of their number lose their lives each year in this noble work, and many more would make the sacrifice if it were demanded of them.

YOU AND YOUR BODY[1]

THE story of that most wonderful mechanism in the world, the human body, can be told in a hundred ways. In Volume IX, pages 249–264, it is told in the simplest way and from the simplest point of view, that of everyday happenings — eating, breathing, seeing, hearing, smelling, tasting, touching, and moving. As we grow older we realize that there are certain things about these bodies of ours which we should know. If you own an automobile, you want to understand its parts, how it is made up, and how it works. So you want to know about your bodily machine, because it is yours, and because you can keep it in better order if you know a few simple facts about its mechanism.

HOW MANY SKINS HAVE YOU?

At least two — the "epidermis" or "cuticle," which is a superficial, thin, outer layer, and the "derma" or "true skin," which lies below. The epidermis is what you see raised by the fluid of a blister. It has little or no feeling, its function being to give protection to the true skin, which is made extremely sensitive by the presence of nerve endings. In the deeper layers of the epidermis is found the pigment or coloring matter which gives color to the skin. The true skin is the organ of sensation, with nerve endings which give rise to sensations of touch, pain, temperature, etc.

HOW ARE HAIR AND SKIN RELATED?

Hair is simply an outgrowth of the skin. It is not surprising, therefore, that the bodies of most animals are covered with hair. In man the epidermis is smooth and soft except in certain portions of the body where it extends into hair. It is interesting to notice that in the physiology of the lower creatures hair has its origin in the epidermis, while feathers and scales grow from the true skin or derma. A hair grows from a tiny pit into which a gland feeds oil, just as glands feed oil into the skin to keep it from getting too dry. Only the lower part of the hair grows, pushing out the part already formed.

WHY DOES HAIR TURN GRAY?

The color of hair depends on the amount of pigment or coloring matter in its fibers. As old age comes on, the blood ceases to supply the elements which make this pigment. In some cases the same effect of lack of proper nourishment for the hair is produced by the condition of the scalp or by the health. It is even said that fear, sorrow, or any strong emotion can create this same condition.

IF YOU COULD LOOK INSIDE YOURSELF

First, let us suppose that you can look inside yourself and see only your bones. That is what happens when you look at an X-ray photograph of a body, where only the bones stand out in a mass of shadows. (See Volume IV, pages 402 and 403.) It is exactly what happens when you look at the skeleton of a human body in which only the bones remain.

There will be the head or skull, and the neck, which is a continuation of the backbone or spinal column. This spinal column is one of the most wonderful parts of the body. If it were a single long bone, as its name sounds, we should not be able to walk or bend or turn as we do. But it is made up instead of a great many small irregular bones, called "vertebræ," which are of different shapes, so that they fit into each other and serve their different purposes. They are bound together by "ligaments," or tough bands of tissue. Connected with this backbone are twelve ribs, which curve round to meet the breastbone in the front of the body, seven of them being attached directly to this breastbone, three joined to those above by soft cartilages, and the lowest two, the "floating ribs," being unattached. This breastbone runs down the front of the body for a short distance, being held in its place by these ribs and by the collar bone and shoulder blades, which run from the breastbone and spine to the arms, making the connection between the trunk of the body and the arms. These, therefore, are the main bones which make up the trunk of the body. They form, as you see, an outer shell into which the

1 See also Volume Eleven, pages 323–395.

soft organs of the body can be packed and by which they can be protected. To appreciate what a wonderful thing it is to have bones, you must read in the story of "Life in the Sea," Volume I, about the soft-bodied animals which finally came to have shells, and about the fish, the eighth wonder of creation (page 242), which was the pioneer of backboned animals. Man is the highest type of backboned animal. Besides the skeleton of the trunk, you will find in the body the bones of the arms, held by the shoulder blade and the collar bone, and of the legs, attached to the spinal column by the hip bones. And there you have the story of the framework of your body.

But what is within this framework? The various organs of the body. The skull is made up of two sets of bones — the face bones and those of the cranium; the former holding the eye, ear, mouth, nose, etc., the latter holding the brain, which is in two parts and is the starting point of what we call the "nervous system." This nervous system runs down the line of the spine in the "spinal cord" and distributes itself all over the body in tiny nerves. Within the great cavity made by the backbone and the ribs are the main organs of the body, separated by a great dome-shaped muscle called the "diaphragm." Above the diaphragm are the lungs, one on each side, and the heart; below, the stomach, the intestines, the liver, kidneys, and other vital organs. Through them all and along the arms and legs run the veins and arteries, carrying blood to and from the heart, and the nerves. Each organ and all the tissues between are made up of glands, sacs, cells, and other tiny life organisms, each carrying on its own work. You can imagine yourself as looking into the body and seeing the main organs, but you would have to have powerful microscopes to understand half its wonders.

WHAT IS THE LONGEST BONE IN THE BODY?

The femur or thigh bone, extending from the hip to the knee.

HOW MUCH WORK DOES THE HEART DO?

The heart is a pump about the size of a closed fist. In a normal person it beats about seventy times a minute, driving the blood round the whole body in a length of time that is somewhere between fifteen and thirty seconds. It has been calculated that in each beat it forces two and a half ounces of blood through its valves, making a total of thirty pounds of blood going through every three minutes.

WHY DOES THE HEART "THUMP" WHEN YOU ARE FRIGHTENED?

The heart is the most reliable friend that you have. When you are studying hard, it pumps an extra supply of blood into the brain. If you start to run a race, the heart beats fast and hard to send the extra blood needed into the limbs and all over the body. When you are frightened, the brain telegraphs the alarm to the heart, which at once begins to pump out more blood, that might be needed if you were going to run away, or to stay and fight. The heart cannot know that when you are frightened you may do neither, but sit still and listen to its thumping.

WHY DO WE FEEL SLEEPY AFTER EATING A HEARTY MEAL?

The minute that food is taken into the stomach, all the blood that is not needed elsewhere rushes to help digest the food. It is drawn from the brain, which relaxes. The brain never makes us feel sleepy when it is full of blood.

WHY DO WE FEEL SLEEPY AT NIGHT?

This is largely a matter of habit, but it has been proved that sleep at night is more beneficial than in the daytime. Sleep comes naturally at regular periods, and there is less at night to attract our attention and keep the mind alert. Light is stimulating to both brain and body, while darkness is soothing. Sleep in the early hours of the night has been shown to be more restful than in the later hours — an argument for early bedtime.

WHY IS YAWNING CONTAGIOUS?

A yawn is a small explosion of pent-up air that breaks from the lungs and comes up through the

mouth. It is like the escape of steam through the safety valve of an engine. Yawning is an involuntary movement produced usually by weariness or a desire to sleep, but because it is controlled by reflex nerve action and is beyond the power of our wills, it can often be set up by suggestion. If we see others yawning, the suggestion is at once made to our minds that we yawn too.

WHAT IS WEARINESS?

Scientists have only recently discovered that "getting tired" is in reality a state of being poisoned. After the muscles of the body have worked a long time, the used or bad blood accumulates faster than good blood can be made. What are called "fatigue poisons" clog the blood and affect the nerves controlling our muscles. Given a little time and rest, Nature will repair this difficulty.

WHAT ARE GERMS?

Tiny living organisms which develop in an animal or plant. Germs are of no harm in themselves, but they may carry disease. The way to avoid any danger from germs or bacteria is to be so healthy that you are not affected by those which might set up life in your mouth or lungs that would do harm.

WHY DO YOU BRUSH YOUR TEETH?

To get rid of any bacteria produced by the action of acids with the food in your mouth. The outside of your teeth is covered with a hard, polished enamel which sheds foreign substances; but within is a substance known as "dentine" which wears away much more easily. You must see that nothing which would act on it has a chance to reach this dentine.

WHAT MAKES THE MOUTH WATER?

If a plate of strawberries is placed before a hungry person, his mouth will actually water at the sight. Often the thought of something good to eat will have the same effect. The water in the mouth is, of course, the saliva which under ordinary circumstances the glands secrete only when there is food to be chewed. The eyes or the memory send to the brain the message that the strawberries look as if they tasted good. The brain receives that message and sends it to the mouth, which responds by setting the salivary glands to work.

WHY DO YOU "SEE STARS" WHEN YOU FALL AND HIT YOUR HEAD?

The blow to the head often jars the optic nerve and shakes the eyeball in such a way that the same nerves are stimulated which would usually be stimulated from outside by light, and the effect is the same as if you saw bright, flashing lights.

DO WE EVER TALK THROUGH THE NOSE?

No. We talk with the tongue, and therefore through the mouth. What is called "talking through the nose" is failing to breathe through the nose while talking. We should always take in breath through the nose, not through the mouth. If we take it in through the mouth, it causes a curious, unpleasant sound in talking.

YOUR BRAIN AND YOUR USE OF IT

The most wonderful thing about your body is that it is a conscious machine, with a nervous system that has its center in the brain, a mass of nerve fibers and nerve cells situated on the two sides of the skull. This brain is like a great telephone switchboard, with hundreds of messages coming in from the nerves all over the body. Of some of these messages which are sent in you are conscious; of others you are not. You touch the tip of a burning match with your finger, and the nerves in the skin take the message up your arm to your brain faster than any telephone message that was ever sent. But the power of your brain does not end with receiving this message. It sends a message back to your finger to pull away from this substance, and the muscles of your finger and arm jump back almost as soon as the burning wood has touched your skin.

Every sensation of which we are conscious comes to us through the brain; but we are not

conscious of every action of the nervous system. If we were, we should be constantly attending to our bodies. We should know every time we winked; we should think every movement so that walking would become a weary set of processes for each one of which we must give a conscious thought. But here the nervous system comes in and with the brain takes the burden "off our minds," that is, from the need of our will and direction, making many of our actions possible as a direct result of the stimulus applied to our sense organs without any consciousness on our part. Certain actions always take place in response to certain impressions received by our sense organs. We cannot help winking if any foreign substance tries to attack our eye, because the law is that in such a case the eyelid shall slip over the eye and protect it. Such an action is called "reflex." As the mirror reflects or "turns back" the rays of light, so the nerves give back a certain response.

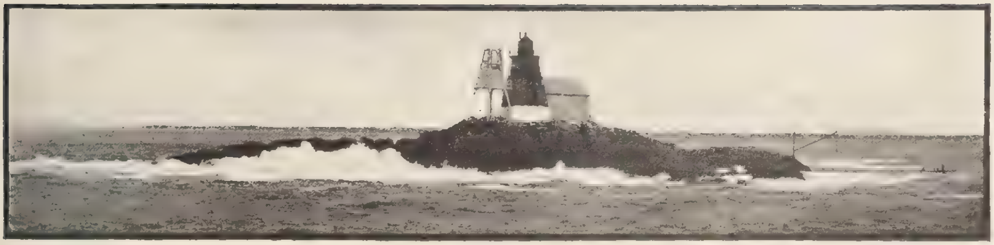
The study of the brain, of its thousands of nerves, and of the location of each group in its "gray matter" is a fascinating subject into which we cannot enter here. But we can think of the brain as we use it, and here we come upon two great subjects, habit and memory.

WHAT IS HABIT?

Besides the power of receiving and sending messages, the nerve centers of our brains have a capacity for acquiring habits. The physical basis of a habit is a pathway worn in your brain, caused by the frequent repetition of the same outer stimulus with a corresponding unchanging response. "An acquired habit," says William James, "from the physiological point of view, is nothing but a new pathway of discharge formed in the brain, by which certain incoming currents ever after tend to escape." Habit is invaluable in diminishing the conscious attention which we must give to our acts. It tends to make them more and more reflex, and thus to free our attention for other things. But habit, having a physical basis, is something to be feared and guarded against as well as rejoiced in. If it is a good habit we are acquiring, we can be glad that a pathway is being worn in our brain which will always bring forth a certain response to a certain call. But if we are falling into a habit that we do not wish to carry through life, we must set up new messages to the brain that will wear a deeper path and tend to obliterate the wrong one which we had begun to make. "The great thing, then, in all education," says Professor James, "is to make our nervous system our ally instead of our enemy."

HOW CAN YOU IMPROVE YOUR MEMORY?

Again we cannot do better than to quote from Professor James's "Psychology," a recognized classic in its wisdom and simplicity, and a book which everyone who is interested to follow the study of the relation of mind and body further should read. "Memory," he says, "is the knowledge of an event, or fact, of which meantime we have not been thinking, with the additional consciousness that we have thought or experienced it before." Every impression which we receive makes some sort of a record on the delicate nerves of the brain. Psychologists now believe that if the proper line of association could be found, every past impression could be brought to recollection. But the problem of memory comes not in the act of remembering. The brain attends to that for us. It is in the act of recalling. "All improvement of the memory lies in the line of elaborating the associates of each of the several things to be remembered." To improve our memories, therefore, we must begin by training our senses to observe carefully. When you are introduced to a person, you must "fix" his name in your mind. You must say it to yourself and think it. You must will to remember it, and then you must associate it with him so that the sight of him will recall the name. In other words, when you are trying to train your memory, you will be training your mind to serve you, and in so doing you will be helping yourself not only along the one line of quick recollection but also along all lines of mental habit. Nothing serves a man better in this world than a quick, active, well-trained mind; nowhere is this shown more clearly than in a good memory. The man who can remember names, faces, and places has gone far on the road to success. He has begun to make his mind the servant of his will, as his body is the servant of his mind.



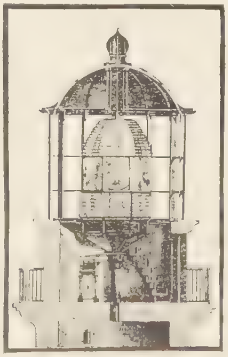
LIGHTHOUSES

HOW BUILT

LIGHTHOUSES are of very ancient origin. As early as 660 B.C. we have mention of a lighthouse. In 260 B.C. a tower 400 feet high was built by the Pharaohs at Alexandria and was considered one of the "Seven Wonders of the World"; it was pictured on Roman medals. Various materials have been employed in lighthouse construction since engineers began to perfect the modern light — stone, brick, iron, steel, concrete, reënforced concrete, and wood. Very little wood is now used, however, as preference is given to the more lasting materials. To build lighthouses on the land is usually comparatively simple. But often it is important, for the protection of shipping, that lighthouses be erected on rocks or reefs exposed to the sea or actually in the water, on sand or rock bottom. Such work has called forth the greatest skill of engineers. Numerous types of construction have been used. Where the foundation is exposed, even at the lowest tides, masonry towers have been, with great labor and often danger, fitted to the bed rock. Otherwise the structure has been erected on iron piles driven, screwed, or pumped into the sand or coral; or on caissons floated to the site and set on the bottom or sunk deeper by the pneumatic process; or by the use of coffer-dams, within which the masonry tower has been erected. Smaller structures have been placed on rip-rap foundations.

THE FIRST LIGHTHOUSE IN AMERICA

The first lighthouse in America was built by the province of Massachusetts in 1715–1716, on an island in the entrance of Boston Harbor. In 1713 a committee reported to the General Court on "the most convenient Place for Erecting a Light House, which will be of great use not only for the Preservation of the Lives and Estates of Persons designing for the Harbour of Boston and Charlestown, but of any other Place within the Massachusetts Bay"; and the court resolved "that the Projection will be of general publick Benefit and Service and is worthy to be encouraged," and the want of such a lighthouse "hath been a great Discouragement to Navigation by the loss of the lives and Estates of several of His Majesties Subjects." In 1719 the keeper petitioned the General Court "that a great Gun be placed on Said Island to answer Ships in Fog." The court voted the gun and it was probably the earliest fog signal in this country. This lighthouse was an object of attack during the early part of the Revolutionary War, and was burned by the Americans and finally blown up by the British in 1776. In 1783 the present Boston Light was built, and in 1790 was ceded to the United States.



THE LIGHT

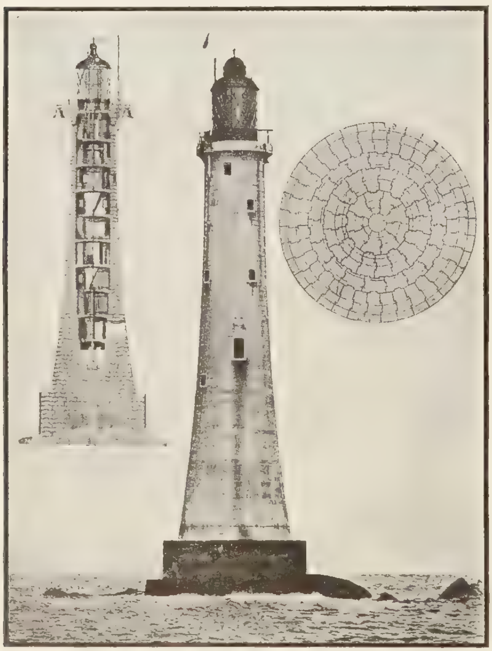
MINOT'S LEDGE LIGHT

The earliest lighthouse in this country built in a dangerous position and exposed to the open ocean was on Minot's Ledge, a reef long a terror to mariners. This was an open work iron frame structure, supported on wrought iron piles wedged into holes five feet deep, drilled

in the rock, which was bare only at low water. It was completed in 1848. In April, three years later, there was a great gale and the lighthouse was swept away, carrying the two keepers with it. The present stone lighthouse at Minot's Ledge was commenced in 1855 and completed in 1860. It ranks among the difficult engineering works of the world. During the first summer only one hundred and thirty working hours were obtained on the rock, and after three years only four stones of the foundation were laid.

EDDYSTONE LIGHT

The most famous of the sea-swept lighthouses is the Eddystone, thirteen miles from Plymouth Harbor, England. This was completed in 1699, after four years' work. During the first year all that was done was to drill twelve holes in the rock and fasten irons in them. This lighthouse, together with the keepers and the engineer who built it, disappeared in the great storm of November, 1703, and since then three other lighthouses have been erected on the Eddystone.



THE EDDYSTONE LIGHT, WITH DIAGRAM SHOWING THE CONSTRUCTION, AND ON THE RIGHT A CROSS SECTION SHOWING HOW THE STONES OF THE FOUNDATION ARE DOVETAILED

MEANS OF LIGHTING LIGHTHOUSES

The early lighthouses were lighted by wood or coal fires burned in open braziers, and later by candles inclosed in lanterns. In 1811 the famous Eddystone Light was lighted by twenty-four wax candles. At the present time lamps with from one to five concentric wicks, and burning a high grade of kerosene, are used in most lighthouses. For the more important lights the incandescent oil vapor lamp introduced by the French in 1898 is used. Electric lights are used at only a few stations in our country because they are so expensive. The electric light at Navesink, on the highlands south of New York Harbor, is the most powerful coast light in the United States. It is estimated at sixty million candle power, and its beam has been reported to have been seen in the sky seventy nautical miles away.

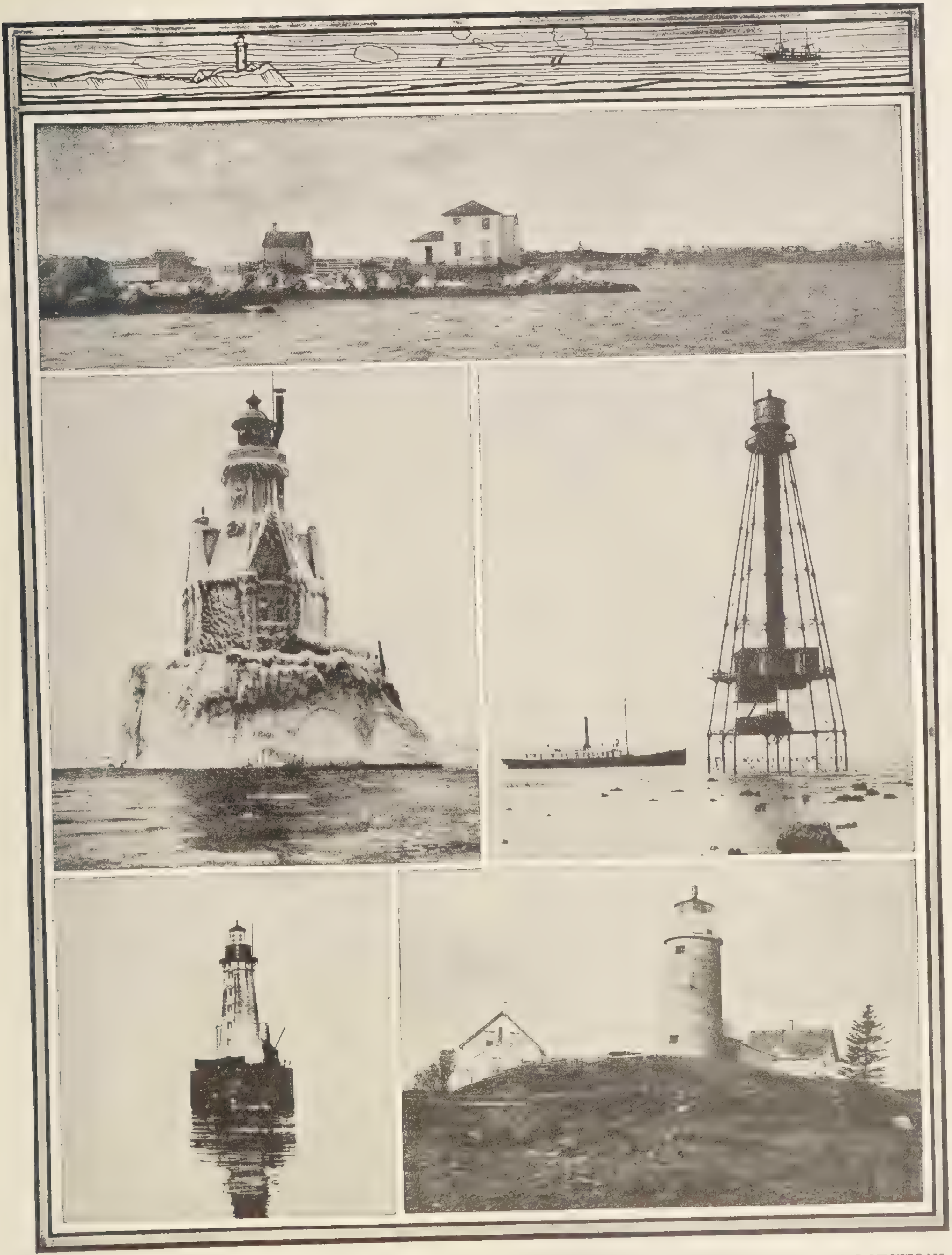
In recent years there have been used a great many acetylene gas-lighted beacons, which are supplied by tanks of gas of sufficient capacity to maintain a quick-flashing light for five months without attention. These lights are placed in many localities where it would not be safe for keepers to live, or where it would be too expensive to station them.

POWERFUL REFLECTORS, LENSES, AND PRISMS

In order to increase the effectiveness of the light, reflectors, lenses, and prisms are used to concentrate the light and throw it out. The largest lens in United States territory is at Makapuu Point Light, Hawaii, and is eight and three quarters feet in diameter.

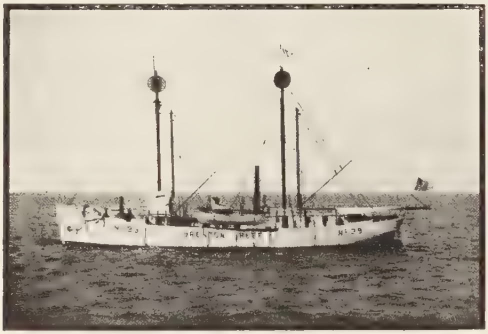
METHODS OF DISTINGUISHING LIGHTS

It is important that lights be distinguished from one another to avoid the possibility of the mariner mistaking them. They are varied by their number, color, intensity, or time of visibility. Color distinctions, especially red, have been widely used, but are not suitable, except



TOP: LIME ROCK LIGHT STATION, NEWPORT HARBOR, R. I. CENTER: RACINE REEF LIGHT STATION, LAKE MICHIGAN, AND SOMBRERO KEY LIGHT STATION, FLORIDA. BOTTOM: STANNARD ROCK LIGHT STATION, MICHIGAN, AND MONHEGAN ISLAND LIGHT STATION, MAINE

for minor lights, because of the great loss of power; with the best color, red, the loss is about sixty per cent. So many systems of flash-



BRENTON REEF LIGHTSHIP, OFF NEWPORT

lights are now available that it is possible to obtain a great variety of differences.

In addition to the lights many marks are provided to guide the sailors during the day. Some lighthouses are painted with stripes or shaped so as to be easily recognized and serve as landmarks. Beacons and spindles are placed to mark shoals or other dangers.

LIGHTSHIPS

But often it happens that it is necessary to put marks in the water where, because of the depth or some other reason, a lighthouse or beacon cannot be built. Lightships are therefore located off the coast to mark the approach to a port or bay, or the outer limit of some off-lying danger. They may be moored in the channel or close to it, and a vessel may steer directly for them so long as collision with the lightship is avoided. They have one great advantage over the lighthouse — if conditions change they may be moved to another site. On the other hand they are more expensive to maintain and are in danger of being driven from their places by storms. If the life in a lighthouse is dreary, that in a tossing lightship is certainly exciting enough.

In addition to lightships, lighthouses, and beacons, other means, such as floating buoys, submarine bells, and fog signals are used to warn mariners.

TROUBLES FROM ICE, BIRDS, AND SAND

Winter seriously increases the work of maintaining aids to navigation; the spray and sleet freezing may completely envelop the lighthouse in ice, obscuring the light until the glass is cleared. Many of the gas buoys must be removed during cold weather because of floating ice, and must be replaced by spar buoys, over which the ice will pass without damage to the buoy. Sometimes spray freezes on bell buoys until the weight of ice overturns them. Sand creates difficulties at some stations located among dunes or wastes of shifting sand. At Cape Henlopen the sand blown by the wind has cut deeply into the window framing of the keeper's house and has ground his window glass so that it is no longer transparent. Fortunately the lantern of the light is too high to be affected. Even flying birds make trouble at lighthouses, as the brilliant light so attracts them that they fly directly for it, and striking the heavy glass of the lantern, are often killed. They have even been known to fly directly through the glass. Therefore some lighthouses have bird-protecting screens around the lantern.

NAVESINK LIGHTHOUSE, NEW JERSEY

DANGERS TO LIGHTHOUSES

There are many dangers which threaten lighthouses. Fire may sweep through and destroy the structure, such fires being sometimes caused by explosions of oil or the overturning

Photographs by Brown Bros., New York

TOP: WOLF LIGHT, ISLE OF WIGHT, AND BREAKWATER AND LIGHTHOUSE, ABERDEEN, SCOTLAND. CENTER: NORE LIGHT-SHIP IN THE NORTH SEA, OFF THE EAST COAST OF ENGLAND. BOTTOM: SOUTHSTARK LIGHTHOUSE, HOLYHEAD, WALES, AND BELL ROCK LIGHTHOUSE, SCOTLAND

LIGHTSHIP, AND GOVERNMENT RELIEF AND SUPPLY STEAMER, SHOWING CONSTRUCTION

of lanterns. Then the tower may be undermined by the sea and collapse. Moreover the sea may cut away the land on which the light is built. Rip-rap lighthouses standing in harbors have often been rammed by ships and demolished. And in addition to these perils there is always the danger from storm and hurricane.

LIGHTHOUSE KEEPERS

Yet despite these dangers and the small pay offered, the government has never lacked brave men and women to faithfully man the lighthouses. One woman, the keeper of Angel Light in San Francisco Bay, reported that after the fog-signal machinery was disabled in 1906 she had "struck the bell by hand for twenty hours and thirty-five minutes until the fog lifted." Later, when the machinery was again out of order, she had stood on the platform outside all night and struck the bell with a hammer, pounding it with all her might.

Almost every boy and girl in America will remember hearing stories of Ida Lewis, who lived at Lime Rock Lighthouse in Newport Harbor for fifty-seven years. She went there with her father as a girl of twelve, and after his death she was for thirty-two years keeper of the light. She is reported to have rescued thirteen persons from drowning.

The keeper of Tillamook Light, south of the Columbia River on the Pacific coast, sends in the following report: "I regret to state that on the evening of the eighteenth or the morning of the nineteenth we lost a portion of the west end of the Rock, water and rocks coming over with so much noise we could not tell when; and we did not know it had departed before next morning when the sea went down, and we could go outside. At 12.35 A. M. on the nineteenth the sea came up and broke one pane in the middle section of the lantern (132 feet above the sea), which also put the light out and flooded the watch-room, as well as down stairs. . . . At 12.50 A. M. we had the light burning and the storm pane in for the rest of the night. The siren whistle was running until the crash came, but was making no regular blasts on account of the water filling the trumpet too fast. After getting the light burning we closed down the fog signal, as the wind hauled to westward and cleared the atmosphere somewhat. Shortly afterward, when taking the siren out to clear it, I found it partly filled with rocks; therefore the water could not get out of it (siren horns are ninety-five feet above the sea). Will also state that everyone under my charge worked hard and faithfully, regardless of water and glass, everybody being drenched to the skin."

These instances are only a few of the scores which might be quoted.

LIGHTHOUSES MAINTAINED BY ALL COUNTRIES

As a large part of the commerce of the world will always be carried on by sea, lights, buoys, and fog signals are essential to safeguard the ships as they approach the continents and follow the coasts; this obligation is now assumed by all modern maritime nations.

The United States leads all nations in the number and excellence of its lighthouses as well as in the actual number of miles thus protected. This measures about 37,370 statute miles. In addition to these figures we have 11,511 miles of coastline in the Philippine Islands and Panama. Furthermore the United States provides 4,020 miles of lights along the American shore of the Great Lakes, and 5,478 miles which are protected along rivers both inland and near the coast.

THE NUMBER OF LIGHTS MAINTAINED BY THE UNITED STATES GOVERNMENT

There are 1,462 lights above the order of river port lights, 762 having resident keepers;

REPLENISHING THE GAS BUOYS IN WINTER

51 lightship stations, and 438 lighted buoys. The total of lighted aids of all varieties is 4,516. There are also 933 fog signals, of which 510 are at fog-signal stations; 43 submarine bells, 124 whistling buoys, and 256 bell buoys. To add to this number there are 6,281 unlighted buoys and 1,474 day marks, or unlighted beacons. The government also maintains under its supervision 516 private aids to navigation.

THE RADIO LIGHTHOUSE

The radio lighthouse has passed the experimental stage and is now a part of the regular service, installed on the Atlantic and Pacific coasts and as far north as Alaska. Its extension at frequent intervals along our whole coast line is only a matter of time and expense.

The limitations of the ordinary lighthouse are obvious. The range of its light signals is limited, and is liable to be diminished by fog or storm at the moment when the light should penetrate farthest. The range of the radio beacon depends only on the power of its apparatus, with from one to two hundred miles as a safe minimum. For coastwise shipping this protection should always be ample. It was first tried out in New York Harbor, was laid aside, as were so many peace-time inventions, during the war, and tested and worked over immediately after the war until a simple and inexpensive apparatus had been designed and approved by the Lighthouse Service. The radio beacon requires only a wooden structure to protect the apparatus. It may be located in a village convenient of access for supplies, instead of on a lonely and exposed point of danger. The signals can be sent out automatically by a clockwork device which requires attention only once or twice a day. The apparatus needed aboard ship to pick up signals is simple, consisting in brief of a simple antenna on the pilot house, a telephone receiver to read the signal, and a compass to locate its direction. (See also Volume II, page 71.)

LAND LIGHTS FOR AIRSHIPS

While the radio is supplementing and may in some cases supplant the lighthouse of the coast, the aviator is calling for a system of land lights for guiding night flyers from coast to coast. A kind of light suitable for observation from above has been standardized by Air Service engineers, while a special form of signal is to indicate the position of a landing field. It is planned to install these lights along our great air routes at intervals of thirty miles.

WHAT IS SMOKE?

SMOKE is made up chiefly of particles of unburned carbon given off from a fire when combustion is incomplete. If sufficient air were supplied to the burning material, and a sufficiently high temperature were maintained, combustion would be complete and no smoke would be formed.

WHY DOES SMOKE RISE?

Gases formed by the burning of fuel rise because their high temperature makes them lighter than the surrounding air. As they come off from the fire they carry with them the particles of unburned carbon which make up smoke.

It has been found that smoke increases not only the number of fogs but also their density. In London probably twenty per cent of the fogs are due to smoky conditions, and the thickness and duration of fogs arising from other causes are increased by the presence of smoke. Smoke is not only destructive of objects on which it falls, but is harmful to both vegetable and animal life, lessening the amount of oxygen which is a necessary food. In great cities and factory districts there are societies which have for their sole object the abating of the smoke nuisance.

WHAT IS THE HOTTEST KNOWN FLAME?

That of the oxyhydrogen blowpipe, which is hydrogen burning in oxygen. Other hot flames are those of alcohol, of gas mixed with air in the Bunsen burner, or of gasoline or kerosene vapor mixed with air in the plumber's flare or the blue-flame stove. The flame of an ordinary gas or kerosene burner is cool, comparatively speaking. None of these flames, however, affords so intense a heat as the electric arc, the most powerful heat agent man has at command.

WHAT ARE THE SPARKS THAT SOMETIMES FALL FROM THE TROLLEY?

When the motorman of an electric car turns on the power, an electric current flows out from the power house along the trolley wire, down through the motors of the car, and back to the power house again through the rails and the ground. So long as this complete circuit is maintained, the current continues to flow evenly and can be stopped only by introducing into the circuit some such nonconductor of electricity as air.

As the trolley car speeds along the street, the trolley wheel frequently strikes against the "ears" or supports of the overhead wire and rebounds a short distance. A small air space is thus left between the trolley wire and the wheel. The strength of the current which has been passing from the wire down to the motors of the car is so great that it cannot change its course immediately. As it flows through the air for an instant a high degree of heat is produced by the resistance of the air. So intense is this heat that small portions of the metal parts between which this "arc" or contact occurs are melted and thrown out in the form of sparks. These sparks are really red-hot bits of the wire or the trolley wheel.

WHAT IS AN ARC LIGHT?

See Volume II, page 74.

WHAT IS A DYNAMO?

See Volume II, page 76.

WHAT IS THE SIZE OF A MOTION-PICTURE FILM?

See Volume II, page 168.

WHO

WHO RECEIVED THE MOST VOTES FOR THE AMERICAN HALL OF FAME?

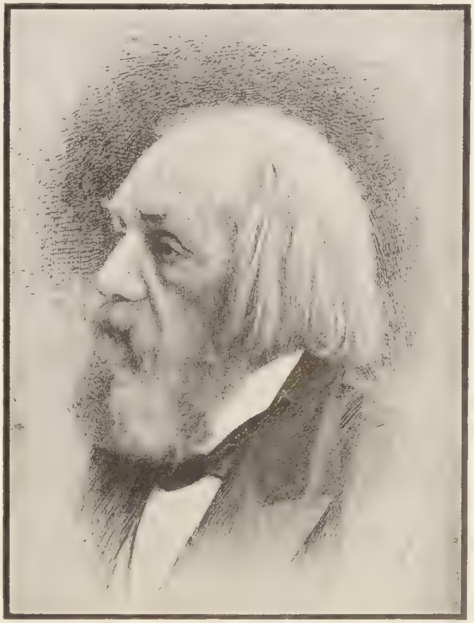
THE judges selected to choose names for the American Hall of Fame, established in 1900 in connection with New York University, gave the highest number for votes (in the order named) to George Washington, Abraham Lincoln, Daniel Webster, Benjamin Franklin, Ulysses S. Grant, John Marshall, Thomas Jefferson, Ralph Waldo Emerson, Robert Fulton, and Henry Wadsworth Longfellow. The list is interesting as showing the consensus of opinion of a group of one hundred educators, historians, scientists, publicists, editors, authors, and judges, representing every state in the Union and selected with the utmost care. In 1900 twenty-nine names were recorded by vote of this body on tablets in the colonnade with one hundred and fifty panels in which are to be inscribed during the twentieth century the names of great Americans. Among these twenty-nine the authors chosen were Emerson, Longfellow, Irving, and Hawthorne; the teachers, Jonathan Edwards, Horace Mann, Henry Ward Beecher, and William Ellery Channing; the scientists, Fulton, Morse, Whitney, Audubon, and Asa Gray; the soldiers, Grant, Farragut, and Lee; the jurists, Marshall, Kent, and Story; the statesmen, Washington, Lincoln, Webster, Franklin, Jefferson, Clay, and John Adams. In an adjoining Hall of Fame for Women the three chosen on the first ballot were Mary Lyon, Emma Willard, and Maria Mitchell.

WHO WAS THE ONLY ENGLISHMAN THAT EVER BECAME POPE?

Nicholas Breakspeare, a native of Langley, Hertfordshire, who became Pope Adrian IV in November, 1154. He lived many years in a monastery in France, was made abbot, cardinal, legate to Denmark and Norway, and then Pope.

WHO SAT UPON A MARBLE THRONE FOR FOUR HUNDRED YEARS?

Charlemagne, who built at Aix-la-Chapelle a palace, chapel, and tomb, and directed that his body be placed in sitting posture upon the marble throne in the tomb. This was done, upon his death in 814. In 1215 the remains were removed from the throne and placed in a gold casket in the cathedral.



Courtesy of Pilgrim Press

EDWARD EVERETT HALE

Preacher, writer, and prominent public man; author of "The Man Without a Country," "A New England Boyhood," "In His Name," "Memories of a Hundred Years," etc.

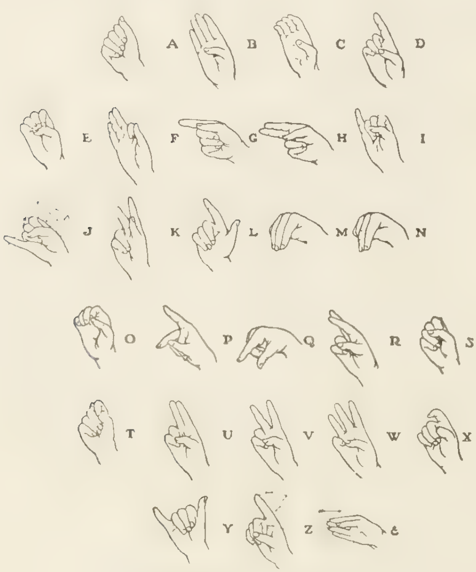
WHEN AND WHERE

WHERE DO PLANTS GROW MORE RAPIDLY, IN NEWFOUNDLAND OR IN MASSACHUSETTS?

IN Newfoundland. If you plant corn in Massachusetts in May and in Newfoundland four weeks later, the fruit will ripen at very nearly the same time; for although the growing season is much shorter in the north, plants grow very much more rapidly there.

WHERE IS ROBINSON CRUSOE'S ISLAND?

In the Pacific Ocean, three hundred and fifty miles west of the coast of Chile, to which it belongs. It is known by the name of Juan Fernandez. The original of Crusoe himself is said to have been a sailor named Alexander Selkirk, who was cast away on the island and lived there alone for four years.



THE SINGLE-HAND ALPHABET

WHERE ARE HOUSE ROOFS HELD DOWN BY STONES?

In Switzerland, where heavy stones are placed on the wooden roofs of the chalets to keep them from being loosened or blown away during winter storms.

WHERE WAS COAL FIRST USED?

So far as we have record, in China. (See Volume IV, page 8.)

WHEN WAS THE THIMBLE INVENTED?

About two hundred years ago the first thimble made its appearance in England. It was a curiously crude affair that had been constructed by a metal worker by the name of John Loffing, and it was dubbed a thimble because of its bell shape and because it was worn on the thumb. It was literally a "thumb bell." In time it was found that this guard would be of more use if made in a size that would fit the finger instead of the thumb. The name, however, clung, and in its shortened form applies to our modern thimbles.

WHERE IS LEARNING MOST RESPECTED?

Probably in China, officially at least. For centuries high distinctions and titles have been conferred on scholars merely for the learning that they have acquired.

WHERE WAS THE CIVIL SERVICE FIRST EMPLOYED?

For many centuries some of the government positions in China have been open only to candidates through a competitive examination in literature, mathematics, history, and kindred subjects.

WHY ARE PEAKS OF MOUNTAINS COLDER THAN VALLEYS?

BECAUSE the air is so thin at these heights that it cannot retain the heat to the same extent as lower down where it is denser.

WHY ARE SUNSTROKES NOT SO COMMON IN THE HOTTEST REGIONS AS IN COOLER ONES?

Exposure to intense heat from the rays of the sun is said to be less dangerous in dry climates than in countries where the temperature is often lower, but the atmosphere more moist. This moisture retards perspiration, which has a cooling effect on the body.

WHY DO WE WEAR BUTTONS ON THE SLEEVES OF OUR COATS?

Because in the olden days gentlemen had to be able to turn back their sleeves, tuck away the lace frills under the cuffs, and have their arms free for swordplay at a moment's notice. A German story gives another reason for this custom. Frederick the Great of Prussia was very particular about the appearance of his soldiers. He is said to have noticed that they had a bad habit of wiping their faces on their coat sleeves. He therefore ordered a row of buttons placed on the cuff of each sleeve, which soon put a stop to the habit.

WHY DOES A GUN KICK?

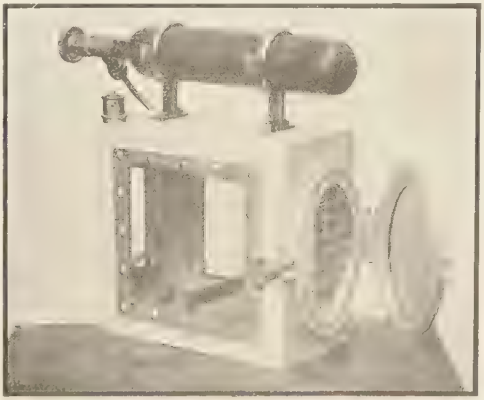
The sudden expansion of the gunpowder in the form of gases has to find its exit in just one direction, through the barrel of the gun. This great volume of gas rushing against the air at the muzzle of the gun pushes the air away and at the same time pushes the gun back. Of course this happens so quickly that the "push" is really a jerk or kick.

WHAT IS THE ORIGIN OF THE CUSTOM OF LIFTING THE HAT?

In the days of chivalry a knight always wore full armor in public. It became the custom for a knight, when entering a company of friends, to remove his helmet, signifying "I am safe in the presence of friends." Lifting the hat has come to us from that custom.

WHY ARE CANARY BIRDS USED IN MINING?

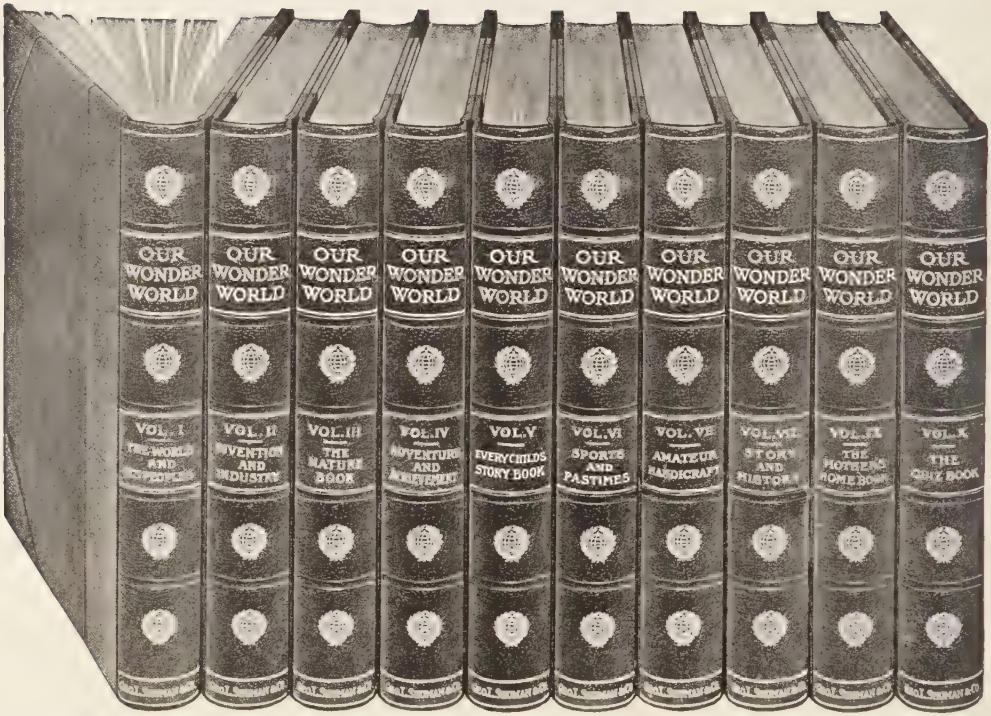
Canaries are very susceptible to the presence of that deadly, odorless gas, carbon monoxide, which occurs in mines after an explosion. Men entering the mines take with them a caged canary, which will show the effects of the presence of the gas long before a man could detect it. In order to revive the canaries a cage, shown in the illustration, has been made, which carries a supply of oxygen that can be set flowing by closing the cage and will revive the bird immediately.



Courtesy of The World's Work

CAGE CARRYING A SUPPLY OF OXYGEN

The closing of the door opens the inner tank and allows the oxygen to flow into the cage.



BEHIND THE SCENES

IN THE MAKING OF THIS SET OF BOOKS

TO tell from the editorial point of view of the making of a set of books would be to give the story of years of research and planning, of finding the right authors who are authorities in their subjects and can tell their knowledge in an interesting way, of months of patient, careful verifying of every statement, fact, date, and figure, and then of the shaping and harmonizing of all this mass of manuscript, written from many points of view, into a consistent whole. It would be to go even farther back into the history of the conception and planning of the series, and into the lives of the authors and editors. But we must be content to begin the story after all the manuscript, or "copy," as the printer calls it, had come into the editorial rooms, and after all the pictures had been gathered. Typewritten sheets of paper, and photographs and drawings of all sizes and descriptions — and then four thousand printed pages with four thousand pictures fitted in! It is the story of what happened between the two halves of that sentence which we are going to tell.

FROM COPY TO TYPE

At the printer's the copy was given to the operator of a "monotype" machine, like that described in Volume II, page 104, who fingered it off on a keyboard like that of a typewriter but much more complicated. Did you ever look carefully at a series of printed lines? In a typewritten line of a certain length there will be room for just so many letters and spaces, all of equal width. For instance, on the machine on which this is being written there are seventy-three spaces, which will mean that each of those spaces may be filled with a letter or a blank,

MONOTYPE KEYBOARDS AND TYPE CASTERS

A LINE PLATE

Contrast this with the half tone on page 325. The difference between the line plate and the half tone is that the half tone shows dots throughout and the other all lines or solids.

giving in all seventy-three letters or spaces between. But if you have ever written on a typewriter, you know that your lines do not come out an even seventy-three, but that the words will end on the sixty-ninth space, or the sixty-seventh, and the right-hand side of your page will be ragged. That must never happen on a printed line, but with different widths of letters and spaces the lines must all come out even. This is one of the reasons why a printed page is so much more attractive than a typewritten page.

A long strip of paper punctured with holes comes off the keyboard machine and is taken to the type-casting machine, where by a complicated mechanism the letters called for by each combination of holes are formed from hot metal and arranged in words and lines in the order called for in the copy. So every letter which goes into the book was made for it. The type was pressed line by line into a long trough called a "galley"; this galley was rolled with an inked roller and a piece of paper pressed down over it to take the impression; and a "galley proof" in long strips was ready to be marked with corrections by the proof readers, corrected by inserting new type where any mistake had been made, and a clean proof "pulled" to be sent to the editors and authors, who could see and revise their work.

HOW ARE THE PICTURES MADE?

Meanwhile the pictures for each story and article have been selected, their size and grouping decided upon, and they have been sent to the engraver, who will make line engravings or half tones from them. This is done by a process known as "photo-engraving," which, making use of the action of light in a camera on sensitive surfaces, has revolutionized within twenty years the illustration of books.

The original from which the engraving is to be made is placed on a board in front of a camera, which slides back and forth on a track until the picture as seen through the camera is the exact size of the engraving desired. If the picture is a drawing to be reproduced in line, like the drawing shown on this page, it is photographed directly through the lens upon a prepared negative inserted in the camera. If it is a photograph, or an original that depends for its effect on shading and coloring rather than on the simple lines of the drawing, a screen is placed between the plate and the lens. This screen is a sheet of glass ruled at right angles with fine lines, usually one hundred and fifty to the square inch for these pictures, the effect of which is to break up the picture into a multitude of tiny dots, as you can see if you use a magnifying glass on one of the pictures in this volume. From this putting the picture through a screen results the name "half tone," since there are no clear whites nor solid blacks in the result, but shaded half tones. These dots afford in the final plate a surface to which the ink may cling.

The plate is then developed, and after being put through various processes is printed on metal. Line plates, which are photographed direct from the original with no intervening screen, are usually printed on zinc, which etches quickly, while half tones are printed on copper, the fine grain of which catches every tiny dot. The plate is then printed, by sunlight or electric light, and is ready to be etched, a process which is too technical to be described here, but which involves the covering of the

plate with some chemical substance capable of resisting the action of acid, and then placing it in an acid bath which will eat it down and put it in printing condition. In a line plate only the outlines will be left, the rest being cut away. In a half tone the high lights and all the delicate shadings will have been brought out. It is in the etching that the skill of the engraver is brought into play, for here hand work combines with mechanical means to produce the best effects. Proofs are then taken of the plates, and if satisfactory they are ready to be mounted on wood "type-high," that is, the exact height of type above the block, and sent to the printer.

HOW ARE THE PAGES MADE UP?

The editor now has in his hands galley proof of columns of type and engraver's proofs of pictures. With these he plans and, in the case of volumes with as many pictures and question headings as these, pastes up each page, placing the picture where he wishes it as related to the type matter and the appearance of the page, writing a title for the picture beneath the proof and pasting the columns of type in the remaining space. This "make-up" is for both the editor and the printer one of the most difficult and special parts of the work. Every page must be planned with regard to the page opposite, so that each opening of the book will present a well-balanced and attractive effect; the pictures must come as near as possible to the type matter which they illustrate; headings must not come at the foot of the page; and a hundred and one rules of good printing must be observed of which we do not think when we glance at a book that is right, but which would be brought to our attention very quickly if they were broken and the wrong effects produced.

The pasted page goes back to the printer, where a skillful workman arranges type and engravings in a page, following in general the scheme which the editor has indicated, setting up the titles for the pictures and the "running head" for each page, which he then binds with a cord or places in an iron frame to hold the type in place. Page proofs are pulled, to be read and revised once more, and this time there are columns which, because of the "make-up" into pages, are two lines short or one line long, to which text must be added or from which words must be cut to make the pages come out right.

FROM TYPE TO PLATE

A final "O.K." is given on each proof by the editor, and the pages are ready to be sent to the foundry, where the plates from which the book is to be printed are made. A wax impression of each type page is taken, and by an electroplating process (see Volume II, page 78) a thin shell of copper is deposited in the mold and takes on the form of the page. This shell, from which the pages are to be printed, is backed with type metal, and the plates are ready to be finished, with the half tones "sweated" into the spaces left for them between type.

This is the process through which each of the four thousand pages of these volumes was put, a process which can be described only in the barest outline, but the skill, perfection, and speed of which make printing hold a high place among the arts.

PRINTING THE FORMS

With the actual printing of a newspaper or book most of us are more familiar. In the printing of a volume like one of these it is the size of the presses and the speed with which they work which stirs the imagination. The plates are placed in sixteen-page forms, the "make-ready" or "evening" of the plates, by slipping in bits of paper so that they will print evenly and each letter and each detail of the engravings will make the best impression possible, is done, and then the great sheets of paper are put into the press, the ink is fed in from a trough, and the sheets are swung off, printed on one side and ready to dry and be "backed up" by sixteen pages more. The great sheets are ready to be folded, laid in consecutive order, and sewed for binding. But before this is done the color pages must be inserted.

THE COLOR PICTURES

Color pictures are printed from plates similar in appearance to those from which ordinary half tones are printed. The making of these plates

is a more elaborate process than that for ordinary plates, involving the use in the camera of filters which neutralize the various colors in succession, giving as a result one plate in which (for a three-color plate like that here illustrated) the red alone appears in its various gradations; another in which the blue appears; and a third in which the yellow appears. From these three plates impressions are taken one above the other with inks of the three colors, the theory of the process being that all colors may be derived from the three primaries, red, blue, and yellow, and that when a picture has been resolved into the three it may then be reproduced by a combination of the three. The use of two colors, as in many of the color pictures in this book, gives, in the various combinations made possible by finely etched plates, a wonderful combination of shades and tones. These pictures are printed in sixteen-page forms, great care being taken to use the inks which will produce the best result. A two-color form requires, of course, two printings, one upon the other; a three-color form, three; and so forth.

AT THE BINDERY

Each of the color pictures must be inserted in its proper place in the carefully laid pile of forms which represents each book in the making. The book is sewed with a strong thread so that it will be held firmly and yet will open easily. The sewed volume is then pressed together in a heavy press; its edges are trimmed; and it is ready to be fastened within the coverboards which have been pasted and lettered. For some editions the tops of the pages are gilded. When it has been fastened into its cover, the book is ready to meet the world, a completed product.

IN THE PRESS ROOM

By permission of Thos. Forman & Sons, Nottingham, Eng., owners of the copyright in colors

M SHOWING THE PROCESS OF MAKING A THREE-COLOR PLATE

INDEX

VOLUMES I–X

INDEX

Main topics and proper names treated as topics are set in **Boldface type.**
Names in CAPITALS are those of authors of articles or of writers from whose works selections appear in the text of "Our Wonder World."
Words in CAPITALS AND SMALL CAPITALS are the titles of articles or selections, which, unless anonymous, are followed by the author's name.
Lines in *italic type* indicate first lines of poems.
The abbreviation *illus.* in parentheses indicates that the reference is to an illustration.

B

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F.R.HARPER